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2 LYMPHOMAS: data from the Spanish Primary Cutaneous Lymphoma Registry.

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77 **ABSTRACT**

78 **Background:** Brentuximab vedotin (BV) has been approved for CD30-expressing
79 cutaneous T-cell lymphoma (CTCL) after at least one previous systemic treatment.
80 However, real clinical practice is still limited.

81 **Objectives:** To evaluate the response and tolerance of BV in a cohort of patients
82 with CTCL.

83 **Methods:** We analyzed CTCL patients treated with BV from the Spanish Primary
84 Cutaneous Lymphoma Registry (RELCP).

85 **Results:** Sixty-seven patients were included. There were 26 females and the mean age
86 at diagnosis was 59 years. Forty-eight were mycosis fungoides (MF),
87 7 Sézary syndrome (SS) and 12 CD30+ lymphoproliferative disorders (CD30 LPD).
88 Mean follow-up was 18 months. Thirty patients (45%) showed at least 10% of CD30+
89 cells among the total lymphocytic infiltrate. The median number of BV infusions
90 received was 7. The overall response rate (ORR) was 67% (63% in MF, 71% in SS and
91 84% in CD30 LPD). Ten of 14 patients with folliculotropic MF (FMF) achieved complete
92 or partial response (ORR 71%). The median time to response was 2.8 months. During
93 follow-up, 36 cases (54%) experienced cutaneous relapse or progression. The
94 median progression free survival (PFS) was 10.3 months. The most frequent adverse
95 event was peripheral neuropathy (PN) (57%), in most patients (85%), grade 1 or 2.

96 **Conclusions:** These results confirm the efficacy and safety of BV in patients with
97 advanced-stage MF, and CD30 LPD. In addition, patients with FMF and SS also showed
98 a favorable response. Our data suggest that BV retreatment is effective in a proportion
99 of cases.

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105 INTRODUCTION

106 Brentuximab vedotin (BV), a humanized anti-CD30 antibody conjugated with the
107 antimetabolic agent monomethyl-auristatin E, has recently been approved for the
108 treatment of CD30 expressing cutaneous T-cell lymphomas (CTCL), after a previous
109 systemic therapy¹⁻³. Due to the low frequency of these lymphomas, there is
110 limited real clinical practice on the use of BV in this setting. In fact, there are still
111 important issues to be addressed, as its efficacy in the mycosis fungoides (MF) variants
112 and Sézary syndrome (SS), its effectiveness in retreatment and the management of the
113 peripheral neuropathy frequently associated with its use.

114 The aim of this study is to evaluate the clinical response and tolerance of BV in a
115 cohort of patients with CTCL from the Spanish Primary Cutaneous Lymphoma Registry
116 (RELCP).

117 MATERIALS AND METHODS

118 Patient selection

119 The RELCP is an ongoing prospective registry of patients with primary cutaneous
120 lymphoma (PCL) in Spain. Participating centers prospectively collected data from all
121 consecutive patients with PCL, including diagnosis, therapies, and updated status. For
122 this study, we analyzed all patients with CTCL treated with
123 BV from 01/10/2018 to 02/10/2021. One cycle of BV typically involves 1.8mg/Kg
124 being administered intravenously once every 3 weeks. The study was approved by the
125 Ethics Committee (Hospital Universitari Bellvitge, in Barcelona, LIN-BRE-2021-01).

126 Patients were classified according to the World Health Organization (WHO)-European
127 Organization of Research and Treatment of Cancer (EORTC) classification criteria⁴.
128 TNM stage was defined according to the International Society for Cutaneous
129 Lymphomas (ISCL) and the Cutaneous Lymphoma Task Force of the EORTC^{5,6}.

130 Response criteria and end points

131 Response to treatment was evaluated according to the following standard definitions:
132 complete remission (CR) is defined as no clinical lymphoma lesions; partial remission
133 (PR), clearance of at least 50% of skin lesions from baseline; stable disease (SD), from

134 25% to <50% decrease of skin lesions; and progressive disease (PD), \geq 25% increase in
135 skin disease from baseline or detection of new lesions after CR is achieved. In SS
136 cases, blood and global responses were evaluated following the criteria proposed by
137 ISCL/EORTC⁷.

138 The endpoints were considered as follow⁷: overall response rate (ORR), percentage of
139 patients achieving CR or PR; progression free survival (PFS), was defined as the time
140 elapsed from first objective response to the relapse/progression or death because
141 of any cause (in patients with disease progression) or until last control (in patients
142 without relapse/progression).

143 **Safety**

144 Patients were monitored for adverse events (AEs) per routine clinical practice.
145 Peripheral neuropathy (PN) was graded as follows according to the WHO rating scale:
146 grade 1 (mild paresthesia and/or decreased tendon reflexes), grade 2
147 (moderate paresthesia and/or mild weakness), grade 3
148 (severe paresthesia limiting daily life common activities), grade 4 (life-threatening
149 consequences, urgent intervention indicated).

150 **Statistical analysis**

151 We performed a descriptive analysis presenting medians or means and associated
152 distribution measures, depending on distribution symmetry. Categorical variables were
153 expressed as absolute numbers and percentages. Differences between main
154 parameters and type of lymphoma were compared using parametric or non-
155 parametric hypothesis tests as appropriate.

156 **RESULTS**

157 Sixty-seven patients were included. The patient's characteristics, clinical responses and
158 adverse events are summarized in Table 1. There were 26 females and the mean age at
159 diagnosis was 59 years [range, 24-92]. Forty-eight were MF (14 of
160 them folliculotropic MF (FMF), 7 SS and 12 CD30+ lymphoproliferative disorders (CD30
161 LPD), including 10 primary cutaneous anaplastic large-cell lymphomas (pcALCL) and
162 2 lymphomatoid papulosis (LyP). The mean follow-up was 18 months. The mean time

163 between diagnosis and BV therapy was 5.7 years with a mean number of previous
164 systemic treatments of 4 [range, 1-11]. Thirty patients (45%) showed at least 10% of
165 CD30 positive cells among the total lymphocytic infiltrate in skin biopsies. The
166 median number of BV infusions received was 7 [range, 1-20].

167 Considering the whole group, ORR was 67% (63% in MF, 71% in SS and 84% in CD30
168 LPD). Twenty-five patients (37%) achieved a CR, 20 (30%) showed a PR, 15 (22%) a SD
169 and 7 (11%) had PD. ORR according to stages were as follow: in the group of MF/SS;
170 stage IIB, 26/35 (74%), stage III, 0/5 (0%) and stage IV, 9/15 (60%); In SS patients 2/7
171 had CR in skin and blood and 3/7 showed PR in skin and blood. In the group of CD30
172 LPD; stage T1, 1/1 (100%), T2, 3/4 (75%), T3, 6/7 (86%). According to CD30 expression,
173 ORR was 58% in patients with < 10% and 70% in those with > 10%. In patients with
174 FMF, ORR was 71% with 50% (7/14) achieving CR.

175 The median time to response was 2.8 months (p25:2.0, p75:4.8) and the
176 median number of BV cycles to achieve the maximum response was 7 (p25:4,
177 p75:12). The median PFS for the whole group was 10.3 months and for the CD30 LPD
178 group was 23.2 months. This difference did not reach statistical significance. (Fig 1).
179 Median PFS in patients with < 10% of CD30 expression was 8.2 months and 10.3
180 months for those with > 10% CD30 expression. During follow-up, 36cases (54%)
181 experienced cutaneous relapse or progression. Thirteen of them were treated again
182 with BV, with a median of 3 additional infusions. The ORR to retreatment was 54%
183 (23% achieved CR). Eight patients (5MF, 2SS and 1 CD30 LPD) received
184 a hematopoietic stem cell transplantation (HSCT) after treatment with BV. Five of
185 them remained in CR at the end of follow-up. In 3 patients a relapse of the disease was
186 observed. One of these patients responded again to BV treatment. One patient died
187 because of disease progression.

188 The most frequent adverse event was PN, observed in 38/67 patients (57%) with 34
189 cases showing grade 1-2 and 4 cases having grade 3 neuropathy. The median number
190 of BV infusions before the first symptom of PN appeared was 4. Patients
191 developing PN received a significantly higher number of BV infusions (mean 9.6) when
192 compared with those without neuropathic symptoms (mean 5.9) (p=0.003, t-
193 test). Dose adjustment was needed in 12 patients and 4 discontinued BV due to

194 PN. There was no association between PN and type of lymphoma ($p=0.83$, Fisher)
195 or percentage of CD30 expression ($p=0.37$, Fisher).

196 In 27 patients (40%) other adverse events were observed during the treatment with
197 BV. Thirteen of them were considered as serious adverse events and are summarized
198 in Table 1. One patient died due to sepsis.

199 After a median follow-up of 18 months, 16 (24%) patients were free of cutaneous
200 lymphoma lesions and 37 (55%) cases showed active disease. Eleven (16%) patients
201 died due to disease progression.

202 DISCUSSION

203 CTCL are a heterogeneous group of extranodal non-Hodgkin lymphomas with different
204 clinical presentation and prognosis. MF, SS and CD30 LPD are the most common types,
205 accounting for more than 70% of cases⁴. Initial stages of MF are usually well controlled
206 with skin-directed therapies for years or decades, but advanced MF and SS are
207 aggressive diseases with no curative treatment so far. These
208 patients use to suffer severe pruritus, low quality of life and reduced survival due to
209 disease progression, immunosuppression and side effects related to multiple lines of
210 therapy.

211 Recently BV has been approved for the treatment of CD30-expressing CTCL patients<sup>1-
212 3</sup>. In the ALCANZA study, a phase III randomized, controlled, multicentric clinical
213 trial, BV showed a superior objective response rate when compared with physician's
214 choice (bexarotene or methotrexate) in patients with CD30-expressing MF or pcALCL.
215 Moreover, a significant improvement in PFS with BV (median 16.7 months)
216 with respect to the group with conventional therapy (3.5 months) was observed¹.

217 In this paper we describe the results in a series of 67 CTCL cases treated with BV from
218 the RELCP in Spain⁸. RELPC is a prospective database including uniform information
219 about diagnosis, treatments, and outcomes so we believe these results to represent
220 the real practice in our country.

221 Considering the whole group, our results showed an ORR of 67% and a median PFS
222 of 10.3 months. **This is in contrast with the results in the ALCANZA trial showing a**

223 global PFS of 16.7 months. We believe that the lower PFS could be explained by the
224 fact that whereas in the ALCANZA, a proportion of MF cases had IA-IB initial stages, in
225 our cohort all MF patients had advanced stages (IIB-IVA2). As the ORR in these cases
226 was 63%, our data strength the notion that BV is an effective treatment in patients
227 with tumoral or more advanced stages of MF¹.

228 In our hands, the clinical response does not seem to be influenced by the level of CD30
229 expression by the lymphoma cells. These data are consistent with recent studies and
230 suggests that BV may be a therapeutic option even in those cases with low or even
231 no expression of CD30^{1,9-12}. However, median PFS was slightly longer in patients with
232 higher expression of CD30. This observation agrees with the results coming from
233 Gosmann et al. and suggests that duration of response can be longer in patients with
234 high CD 30 expression¹³.

235 In addition, we observed a high rate of CR in patients with FMF (Fig. 2a-d), a variant of
236 MF that due to the deep location of the infiltrate, is considered particularly resistant to
237 skin-directed therapies. Although in the ALCANZA trial no specific information about
238 this MF variant was given¹, our results agree with recent observations and suggest that
239 BV may be an effective option in FMF^{9,14}.

240 Looking at the CD30 LPD, in this study we included 10 pcALCL and
241 2 LyP. Eight of the 10 pcALCL patients had advanced stages with extracutaneous
242 involvement. The ORR in this setting was 84% with a 42% of CR rate. Most patients in
243 this group showed a quick and durable response to BV with a median PFS of 23.2
244 months. Although not statistically significant, the differences in PFS in the CD30 LPD
245 group in comparison with the total group are striking and may reflect the better
246 behavior and clinical prognosis of this group of lymphomas. Although only two cases
247 of LyP were included, both cases experimented CR to BV. In a phase II open-label
248 study, Lewis et al reported an ORR of 100% and a CR rate of 75% in patients
249 with LyP treated with BV¹⁵. These authors suggested that BV could be
250 an alternative treatment for patients with severe forms, resistant to conventional
251 therapy. We believe that more studies are needed to determine
252 the right BV regime in LyP, a process characterized by a chronic and indolent
253 course, with the aim of minimizing the risks of PN.

254 Regarding the SS, there were 7 patients in our study showing an ORR of 71%,
255 including 2 CR. Given that patients with SS were not included in the ALCANZA study,
256 the indication of BV in this form of CTCL has been a matter of discussion¹. In
257 a recent series of 13 SS patients, an ORR of 38% was observed after 6 cycles of BV. The
258 authors concluded that there appear to be no advantages over other forms of
259 conventional treatment and suggested that this may be due to the lower expression of
260 CD30 in SS¹⁶. These data are in contrast with those recently published by Papadavid et
261 al. showing no differences in ORR or PFS between patients with SS and MF⁹.
262 Although more studies focusing SS are necessary, we believe that our results
263 agree with those of Papadavid et al. and suggest that BV may be an effective option in
264 patients with SS.

265 Eight patients achieving CR after BV, underwent successful HSCT. Therefore, in
266 selected cases BV may facilitate bridging to a successful HSCT^{17,18}.

267 Regarding BV retreatment, there is limited information so far. Engelina et al. reported
268 a second course of BV in 2 patients with 1 PR after 2 cycles and 1 SD after 10
269 cycles¹⁹. Papadavid et al. reported 3 cases retreated with BV but information about
270 clinical response was not given⁹. André et al. described a clinical response to BV
271 retreatment in 2 patients with transformed MF relapsing after HSCT¹⁸. In our
272 series, 13 patients received a second course of therapy showing an ORR of
273 54%. Although further studies are needed, our results suggest that a significant
274 proportion of patients may achieve clinical benefits after BV retreatment.

275 In general, BV was well tolerated. As expected, PN was the most frequently observed
276 AEs in our patients, affecting 57% of them. In agreement with data from the phase II
277 and phase III clinical trials, most patients had mild to moderate symptoms and only a
278 minority of them needed dose adjustment or treatment discontinuation¹⁻³. In
279 our series, PN was clearly related to the accumulative dose with most patients
280 initiating symptoms after 5-6 BV infusions. Also, in agreement with recently published
281 data from ALCANZA subanalysis, in our series no association between the PN and the
282 type of lymphoma or level of CD30 expression was found²⁰. At the end of follow-up, 2
283 patients presented complete resolution of PN, 2 patients had PN grade 3 and the rest
284 of the cases continued with mild or moderate symptoms (grade 1 or 2).

285 In conclusion, this study represents the second largest series of CTCL patients treated
286 with BV in real clinical practice published to date. Our results confirm the data
287 reported in ALCANZA and previous real world published data. In addition, this study
288 adds new information supporting the role of BV in the treatment of the advanced
289 forms of MF, FMF, and SS. Data coming from our patients also suggests that a BV
290 retreatment could be effective. A limitation of this study is the low number of patients
291 in some subgroups.

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Comentado [OSB1]: Si pones el nombre de la revista en cursiva, también tiene que ir así la numeración y paginas. Hay que corregir los espacios entre el titulo y después del; en todas las referencias

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376

377 **Figure legend**

378 **Figure 1.** Kaplan-Meier curve for progression free survival in patients with mycosis
 379 fungoides, Sézary syndrome and CD30+ lymphoproliferative disorders treated with
 380 Brentuximab Vedotin.

381 **Figure 2.** Patients with folliculotropic mycosis fungoides treated with
 382 Brentuximab Vedotin.

383 Figure 2 (a). A 70-year-old patient presented with infiltrated erythematous plaques
 384 and tumors in the face,

385 Figure 2 (b). The patient achieved complete remission after 6 cycles of
 386 Brentuximab Vedotin.

387 Figure 2 (c). A 92-year-old patient presented with rapidly growing ulcerated tumor
 388 lesions in the face.

389 Figure 2(d). The picture shows complete response after 7 cycles of treatment.

390

391 **Table legend**

392 **Table 1.** Clinical characteristics, responses, and adverse events in cutaneous T-cell
 393 lymphoma patients treated with Brentuximab Vedotin.

Eliminado:

Eliminado: facial area

Eliminado: on

Eliminado: responses

Eliminado: of