22. Kordasti SY, Afzali B, Lim Z, Ingram W, Hayden J, Barber L, et al. IL-17-producing CD4(+) T cells, pro-inflammatory cytokines and apoptosis are increased in low risk myelodysplastic syndrome. Br J Haematol. 2009;145:64-72.
23. Kordasti SY, Ingram W, Hayden J, Darling D, Barber L, Afzali B, et al. CD4+CD25high Foxp3+ regulatory T cells in myelodysplastic syndrome (MDS). Blood. 2007;110:847-50.
24. Chen X, Eksioglu EA, Zhou J, Zhang L, Djeu J, Fortenbery N, et al. Induction of myelodysplasia by myeloid-derived suppressor cells. The Journal of clinical investigation. 2013;123:4595-611.
25. Ansell SM, Lesokhin AM, Borrello I, Halwani A, Scott EC, Gutierrez M, et al. PD-1 blockade with nivolumab in relapsed or refractory Hodgkin's lymphoma. The New England journal of medicine. 2015;372:311-9.

Supplementary Table Legends

Supplementary Table 1. Antibodies used for mass cytometry staining.

Figure Legends

Figure 1. Clinical Imaging and Blood Counts. A) Pre-therapy and post-therapy PET/CT scans are shown that highlight a lingular metastasis that increases in size during the course of therapy. B) Select peripheral blood counts and blast cells by manual differential are shown prior to and during therapy. The patient had a pre-existing thrombocytopenia (green line) that worsened over time. After therapy initiation, blasts (yellow) are seen to increase as hemoglobin (Hgb, orange line) drops and white blood cells (blue line, same scale as Hgb) remain in the normal range. As of 9 months post therapy initiation, the patient remains on anti–PD-1 therapy.

Figure 2. Identification of peripheral blasts by mass cytometry in a melanoma patient undergoing anti–PD-1 therapy. A 33 parameter mass cytometry panel was used to immunophenotype peripheral blood from a melanoma patient over the course of anti–PD-1 therapy. A) Cells positive for nucleic acid intercalator, a marker of nuclear DNA, and low for CD45 were identified over the course of therapy, but not in a healthy donor. B) The majority of $CD45^{lo}$ events (blue gate) from the patient expressed intermediate levels of CD33 and high levels of both HLA-DR and CD38 compared to non-blasts, consistent with peripheral myeloblast phenotype. C) Peripheral blasts increased from 1.16% to 4.65% of all PBMC (left). The percentage of T (light blue), B (yellow), and NK (red) cells declined over the course of therapy while the percentage of myeloid cells (green) increased (right).

Figure 3. Frequency of $PD\text{-}1^+$ monocytes in this case remained higher during therapy than in untreated healthy controls. A) The percentage of $PD\text{-}1^+$ cells was determined for blasts, CD8 T cells, CD4 T cells, myeloid cells, NK cells, and B cells. For healthy, $n = 5$. B) Biaxial plots show the increase of activated monocytes through dual expression of CD45RA and HLA-DR on non-lymphoid cells from a healthy donor and from the patient over the course of anti–PD-1 therapy.

Figure 4. Peripheral blast phenotype shifts dramatically over the course of anti–PD-1 therapy. A) CD45lo events from the patient were gated and used to create a viSNE map. Blue gates identify major islands of cell density over all four time points. Each population denoted by the letter P followed by a number. B) Increase in cell density within each population (P, right) is shown as fold change over percentage of cells within sectors from the pre-therapy sample (left). C) A heatmap displays intensities of 28 measured proteins for each population identified on the viSNE map. Intensity is shown as heat, calculated as a transformed ratio of medians by the table's minimum.