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Contributions: K. Hosokawa, P. Muranski, X. Feng, S. Kajigaya, A.J. Barrett and N.S. Young participated in the design of this analysis. K. Hosokawa conceptualized, conducted the experiments, analyzed the data, interpreted the results, and drafted the manuscript. K. Keyvanfar conducted the cell sorting. K. Hosokawa and J Chen conducted the mouse experiments. X. Feng, D.M. Townsley, B. Dumitriu, C.S. Hourigan, and J.G. Taylor recruited patients to participate in the study. P. Muranski, X. Feng and S. Kajigaya edited the manuscript. N.S. Young was involved in conceptualization, interim discussions, interpretation of results, and editing the manuscript. All authors critically reviewed the manuscript content and agree with the submission of the final manuscript.