The ineffectiveness of antiangiogenic therapies

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Declarations

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Competing interests

The Author declares that he has no competing interests.

References

1. Folkman J. Tumor angiogenesis: therapeutic implications. N Engl J Med. 1971;285:1182-1186. View Article Google Scholar

2. Teicher BA. A system approach to cancer therapy (antiangiogenesis plus standard cytotoxics → mechanism(s) of interactions. Cancer Metastasis Rev. 1996;15:247-272. View Article Google Scholar

3. Hurwitz H, Fehrenbacher L, Novotny W, Cartwright T, Hainsworth J, Heim W, Berlin J, Baron A, Griffing S, Holmgren E, Ferrara N, Fyfe G, Rogers B, Ross R, Kabbinavar F. Bevacizumab plus irinotecan, fluorouracil, and leucovorin for metastatic colorectal cancer. N Engl J Med. 2004;350:2335-2342. View Article Google Scholar

4. Reddy GK, Bukowski RM. Sorafenib: recent update on activity as a single agent in combination with interferon-alpha 2 in patients with advanced-stage renal cell carcinoma. Clin Genitour Cancer. 2006;4:246-348. View Article Google Scholar
5. Demetri GD, van Oosterom AT, Garrett CR, Blackstein ME, Shah MH, Verweij J, McArthur G, Judson IR, Heinrich MC, Morgan JA, Desai J, Fletcher CD, George S, Bello CL, Huang X, Baum CM, Casali PG. Efficacy and safety of sunitinib in patients with advanced gastrointestinal stromal tumour after failure of imatinib: a randomized controlled trial. Lancet. 2006;368:1329-1338.
  
6. Eto M, Naito S. Molecular targeting therapy for renal cell carcinoma. Int J Clin Oncol. 2006;11:209-213.
  
7. Ellis LM, Hicklin DJ. Pathways mediating resistance to vascular endothelial growth factor targeted therapy. Clin Cancer Res. 2008;14:6371-6375.
  
8. Shojaei F, Ferrara N. Role of microenvironment in tumor growth and in refractoriness/resistance to antiangiogenic therapies. Drug Resist Update. 2008;11:219-230.
  
9. Miller KD. E2100: a phase III trial of paclitaxel versus paclitaxel/bevacizumab for metastatic breast cancer. Clin Breast Cancer. 2003;3:421-422.
  
10. Yang JC Haworth L Sherry RM Hwu P Schwartzentruber DJ Topalian SL Steinberg SM Chen HX Rosenberg SA A randomized trial of bevacizumab, an anti-vascular endothelial growth factor antibody, for metastatic renal cancer N Engl J Med 2003 349 5 427 432 10.1056/NEJMoa021491
  
11. Miller K, Wang M, Gralow J, Dickler M, Cobleigh M, Perez EA, Shenkier T, Cella D, Davidson NE. Paclitaxel plus bevacizumab versus paclitaxel alone for metastatic breast cancer. N Engl J Med. 2007;357:2666-2676.
  
12. Kabbinavar F, Hurwitz HI, Fehrenbacher L, Meropol NJ, Novotny WF, Lieberman G, Griffling S, Bergsland E. Phase II, randomized trial comparing bevacizumab plus fluorouracil (FU) leucovorin (LV) with FU/LV alone in patients with metastatic colorectal cancer. J Clin Oncol. 2003;21:60-65.
  
13. Jain RK, Duda DG, Clark JW, Loeffler JS. Lessons from phase III clinical trials on anti-VEGF therapy for cancer. Nat Clin Pract Oncol. 2006;3:24-40.
  
14. Bergers G Hanahan D Modes of resistance on antiangiogenic therapy Nat Rev Cancer 2008 8 8 592 6032874834 10.1038/nrc2442
  
15. Ribatti D. Biomarkers of response to angiogenesis inhibitors: an open and unsolved question. Eur J Cancer. 2010;46:6-8.
16. Hida K, Hida Y, Amin DN, Flint AF, Panigrahy D, Morton CC, Klagsbrun M. Tumor-associated endothelial cells with cytogenic abnormalities. Cancer Res. 2004;64:8249-8255. View Article  Google Scholar

17. Hida K, Klagsbrun M. A new perspective on tumor endothelial cells: unexpected chromosome and centrosome abnormalities. Cancer Res. 2005;65:2507-2510. View Article  Google Scholar

18. Ribatti D. Antiangiogenic therapy accelerates tumor metastasis. Leuk Res. 2010;-. View Article  Google Scholar

19. Paez-Ribes M, Allen A, Hudock J, Takeda T, Okuyama H, Vinals F, Inoue M, Bergers G, Casanovas O. Antiangiogenic therapy elicits malignant progression of tumors to increased local invasion and distant metastasis. Cancer Cell. 2009;15:222-231. View Article  Google Scholar

20. Ebos JM Lee CR Cruz-Munoz W Bjarnason GA Christensen JG Kerbel RS Accelerated metastasis after short-term treatment with a potent inhibitor of tumor angiogenesis Cancer Cell 2009 15 3 232 2394540346 10.1016/j.ccr.2009.01.021

21. Grothey A, Sugrue MM, Purdie DM, Dong W, Sargent D, Hedrick E, Kozloff M. Bevacizumab beyond first progression is associated with prolonged overall survival in metastatic colorectal cancer: results from a large observational cohort study (BriTE). J Clin Oncol. 2008;26:5326-5344. View Article  Google Scholar

22. Jain RK. Normalization of tumor vasculature: an emerging concept in antiangiogenic therapy. Science. 2005;307:58-62. View Article  Google Scholar

23. Claes A, Wesseling P, Jeuken J, Maass C, Heerschap A, Leenders WP. Antiangiogenic compounds interfere with chemotherapy of brain tumors due to vessel normalization. Mol Cancer Ther. 2008;7:71-78. View Article  Google Scholar

24. Casanovas O, Hicklin DJ, Bergers G, Hanahan D. Drug resistance by evasion of antiangiogenic targeting of VEGF signaling in late-stage pancreatic islet tumors. Cancer Cell. 2005;8:299-309. View Article  Google Scholar

25. Relf M, LeJeune S, Scott PA, Fox S, Smith K, Leek R, Moghaddam A, Whitehouse R, Bicknell R, Harris AL. Expression of the angiogenic factors vascular endothelial cell growth factor, acidic and basic fibroblast growth factors, tumor growth factor β-1, platelet-derived growth factor, platelet-derived endothelial cell growth factor, placenta growth factor, and pleiotrophin in human primary breast cancer and its relation to angiogenesis. Cancer Res. 1997;57:963-969. View Article  Google Scholar