Perioperative anemia, blood transfusions and cancer recurrence

Juan P. Cata M.D.
Assistant Professor
Department of Anesthesiology and Perioperative Medicine
The University of Texas – MD Anderson Cancer Center
Founder and Chair
Anesthesia and Surgical Oncology Research Group (ASORG)
Houston, USA
jcata@mdanderson.org

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• Funding from Hospira, Inc (Advisory Board)
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Objectives
• To highlight the importance of:
  – Perioperative anemia (Evil #1)
  – Transfusions (Evil #2)
  – Anemia + Transfusions (Evil #3)
  – Cancer recurrence, cancer-related mortality and overall survival

Preoperative anemia as a surrogate of tumor burden or sickness

Unpublished data

Preoperative anemia

• 30%-90% of cancer patients
• Women Hb<12g/dL . Men Hb<13 g/dL
• Multifactorial
• Hb < 6 g/dl is associated with an increased risk of mortality in the general population

Preoperative anemia and inflammation in esophageal cancer

Preoperative anemia and inflammation in NSCLC cancer

Preoperative anemia and inflammation in ovarian cancer

Unpublished data

Preoperative anemia as a surrogate of tumor burden or sickness

NSCLC (n=1,703)

Esophageal cancer (n=795)

Ovarian cancer (n=364)
Preoperative anemia and oncological outcomes

- Most studies suggest an association between preoperative and poor RFS, CSS and OS
  
  Cato et al, BMC Anesth, 2013
  ObstetGynecolSci, 2014
  PlosONE, 2014
  BMC cancer, 2014

Intraoperative and postoperative acute anemia

- Part of the surgical stress response
  - Catecholamine release
  - Release of proinflammatory cytokines (IL-6)

MRD

Tumor Hypoxia (HIF-1)
Surgical stress response

Unpublished data
Perioperative anemia and BT

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What happens when we transfuse RBCs?

- Increase in the mass of RBCs and Hb
- Hope to improve O₂ delivery
- Increase risk of hemolytic reactions/infections
- Volume overload (TACO)
- Hyperkalemia
- Immunosuppression

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Transfusion-related immunosuppression (TRIM)

- Multifactorial process
  - Donor leukocytes - microchimerism
  - Storage lesion (Inflammatory soup)
  - Hb derivates
  - Growth factors (VEGF, TGF-β, PDGF)
  - Microparticles
- Two types
  - A) Specific reaction to the donor cells
  - B) Generalized reaction (leucocytes – microchimerism)
  - Infections and cancer-recurrence??

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TRIM and NO-TRIM effect

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Perioperative blood transfusions and recurrence of colorectal cancer (Review)

- Perioperative blood transfusions increase the risk of recurrence by 10%
- RCTs alone show an increase in the risk of 42%
- Early stage (93%) – Late stages (51%)

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Effects of Allogeneic Red Blood Cell Transfusions on Clinical Outcomes in Patients Undergoing Colorectal Cancer Surgery: A Systematic Review and Meta-Analysis

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Perioperative blood transfusion adversely affects prognosis after resection of lung cancer: a systematic review and a meta-analysis
Blood transfusion and cancer recurrence

- The impact of blood transfusions is not the same for all cancers

Prostate cancer
Colorectal, HPB and gastric cancer
Large tumors?
Difficult technique?
Sicker patients?

Autologous versus Allogeneic

- Evidence for any beneficial effect for autologous BT is lacking
Survival
Recurrence

1-2 Units (OR: 1.4) 3-4 Units (OR: 1.69) >5 Units (OR: 2.02)

Amato & Pescatori, Cochrane, 2006
Cata et al, BMC Anesth, 2013

Does the number of units matter?

Risk of recurrence

Intraoperative autologous collection

- Acute normovolemic hemodilution
- “Cell salvage”

Mix population of patients
Waters et al, Transfusion, 2012

Blood Storage Duration and Biochemical Recurrence of Cancer After Radical Prostatectomy

Blood Storage Duration and Biochemical Recurrence of Cancer After Radical Prostatectomy

Joh P. Costa, MD, Eric A. Keen, MD, Michael A. Brunt, MD, Jordan E. Dalton, MD, Edward Masci, PhD, Jerome O’Riordan, MD, Anatole Bussel, MD, Andrew Knoe, MD, Benjamin Ben-Eliyah, PhD, and Daniel R. Sorrell, MD

The least of 3 evils: Exposure to red blood cell transfusion, anemia, or both?

J Thor Cardiovasc Surgery, 2013

Gabi Liao, MD, Jeevanandam Rajewarman, PhD, Liang Li, PhD, Joseph P. Sales III, MD, Eugene H. Blaylock, MD, MD, Keith R. McCune, MD, and Collen G. Koch, MD, MS, MBA
Conclusions

- Perioperative anemia is an independent risk factor for poor oncological outcomes.
- 4 meta-analysis show an association between BT and poor oncological outcomes for lung, HPB, gastric and colon cancer.
- Anemia and BT are associated with the worse oncological outcomes.

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