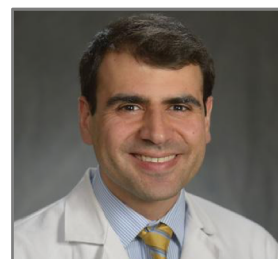


Long-Term Effects of a Transplant Using Your Own Stem Cells (Autologous Transplant)

Celebrating a Second Chance at Life Survivorship Symposium

April 29 – May 5, 2023



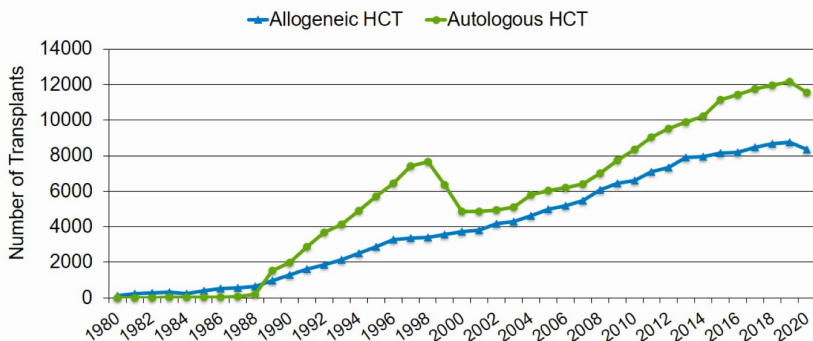
Alfred Garfall MD
Hospital of the University of Pennsylvania

Learning Objectives

- Brief review of autologous stem cell transplantation.
- Discuss major healthcare and health maintenance issues after autologous stem cell transplant.

Who are autologous stem cell transplant patients?

Number of HCTs in the US Reported to CIBMTR by Transplant Type



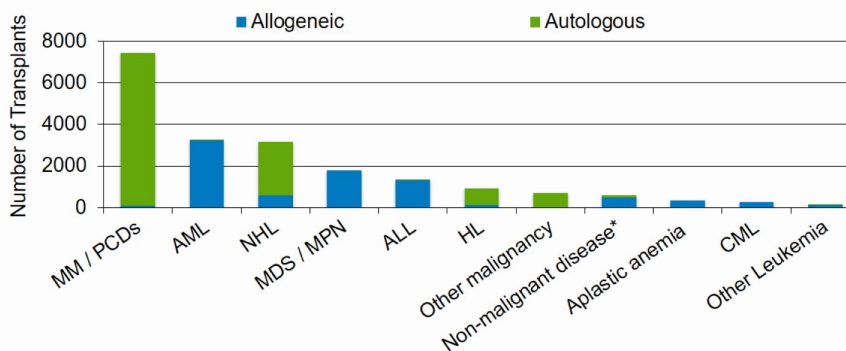
2



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Who are autologous stem cell transplant patients?

Number of HCTs by Indications in the US, 2020



Abbreviations –
 MM: Multiple myeloma;
 PCDs: Plasma cell disorders;
 AML: Acute myelogenous leukemia;
 NHL: Non-Hodgkin lymphoma,

MDS: Myelodysplastic syndromes;
 MPN: Myeloproliferative neoplasms;
 ALL: Acute lymphoblastic leukemia;
 HL: Hodgkin lymphoma;

CML: Chronic myeloid leukemia

*excludes Aplastic anemia

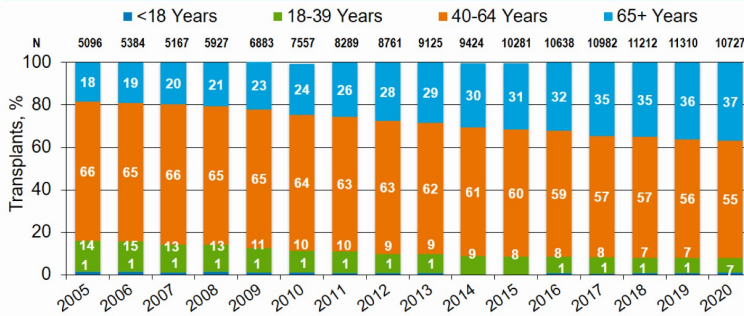
34



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Who are autologous stem cell transplant patients?

Relative Proportion of Autologous HCTs for Malignant Diseases* in the US by Recipient Age



*Includes Non-Hodgkin lymphoma, Hodgkin lymphoma, Multiple myeloma/Plasma cell disorders

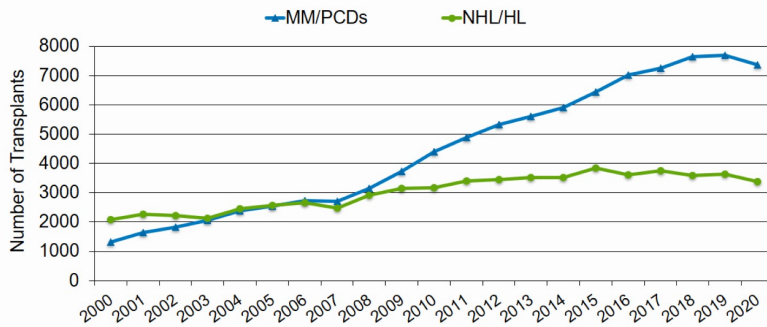
33



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Who are autologous stem cell transplant patients?

Number of Autologous HCTs in the US by Selected Disease



Abbreviations – MM: Multiple myeloma; PCDs: Plasma cell disorders; NHL: Non-Hodgkin lymphoma; HL: Hodgkin lymphoma

48



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What happens during an autologous stem cell transplant?

- High-dose chemotherapy
 - Multiple myeloma: melphalan
 - Lymphoma: BEAM, BCV, Busulfan + cyclophosphamide, TBI
 - BCNU (carmustine)
 - Etoposide
 - Ara-C (cytarabine)
 - Melphalan
 - BCNU (carmustine)
 - Cyclophosphamide
 - VP-15 (Etoposide)
 - Total body irradiation
- Re-infusion of your own stem cells

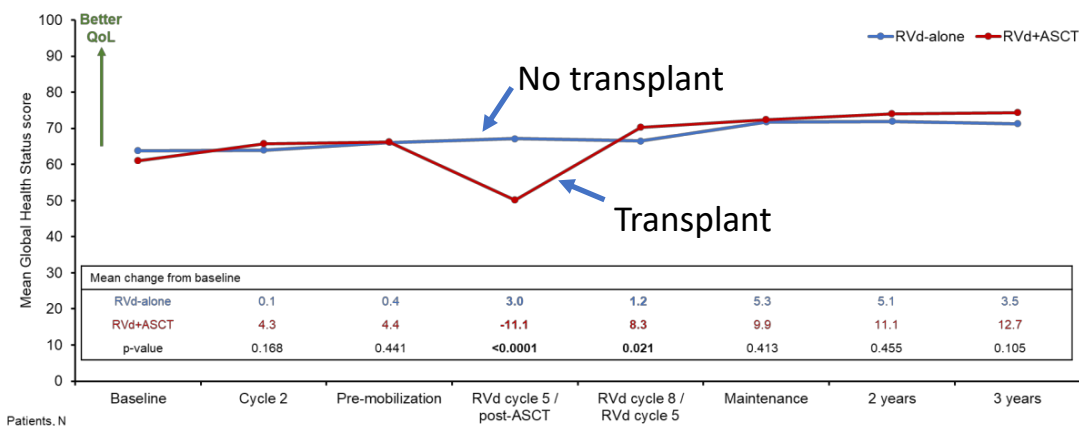
Autologous Transplants are different than Allogeneic (donor) Transplants

- Less transplant-related complications
 - No GVHD
 - No immunosuppressive meds
- More disease-related effects
 - For myeloma, maintenance therapy and expected disease progression and additional therapy.
- Increases in risk of normal health problems
 - Cardiovascular/lung disease (prior therapies + transplant)
 - Impaired “immune health” (infections and autoimmune disease).
 - Second cancers and reproductive/sexual health

Recovering from Autologous Stem Cell Transplant

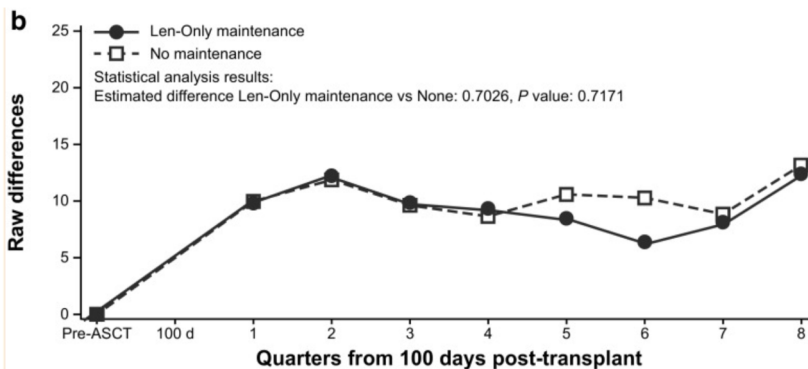
- Early phase (first few months)
 - Recover blood counts
 - Food/fluid intake
 - Watch for “autologous GVHD”
 - Watch for infections
 - Gradually improving energy
- Late phase (months-years)
 - Continued physical recovery
 - Re-vaccination
 - Resume normal health maintenance routines

Most Patients are Expected to “Return to Normal” Patient-reported quality of life (myeloma)



Effects of Maintenance Therapy for Myeloma

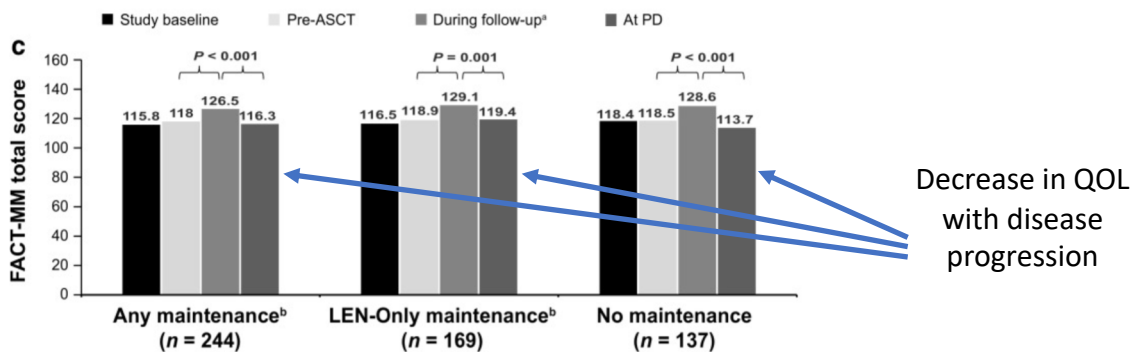
- Lenalidomide (Revlimid) is the most commonly used drug
- Side effects include diarrhea, fatigue, and decreased cognition



Abonour et al., Ann Hematol. 2018; 97(12): 2425–2436.
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Effects of Maintenance Therapy for Myeloma

- Decrease in quality of life (Q)OL with disease progression



Abonour et al., Ann Hematol. 2018; 97(12): 2425–2436.
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Commonly Reported Medical Problems Late after Autologous Transplant

- Survey of 389 myeloma/lymphoma patients ≥ 5 years post transplant
- Problems reported with $>10\%$ incidence:
 - Sexual dysfunction
 - Shingles
 - Cataracts
 - Osteoporosis/osteopenia
 - Joint replacement
 - Skin cancer

Late pulmonary complications

- Idiopathic pulmonary syndrome: \sim day 60, rare ($<5\%$), treated with steroids
- Lung inflammation caused by chemotherapy (BCNU/carmustine):
 - Up to 20% of patients
 - Usually within 3 months of transplant
 - Risk factors: prior chest radiation, higher BCNU dose, prior bleomycin, younger age
 - Treated with steroids
 - Vast majority of patients recover

Cardiovascular complications

- Attributed to heart/lung radiation and/or doxorubicin (a.k.a. adriamycin) chemotherapy, which is part of lymphoma treatment (CHOP, EPOCH, ABVD).
- Increased long-term risk of congestive heart failure
 - NHL: ~200 extra cases of heart failure than would be expected per 1,000 patients over 10 years.
 - HL: ~twice the number of cardiovascular complications compared to controls.

Immune Health

- Difficult to study/uncertainties:
 - effects of disease/therapy vs effects of transplant
- Large study in lymphoma survivors:
 - Lifelong increased risk of infection and autoimmune disease
 - Not much difference in risk between patients who did and did not receive a transplant

Managing Infection Risk

- Early phase:
 - Preventative antibiotics
 - Early treatment of fever
- Late phase:
 - Vaccination
 - For some patients, antibody replacement therapy - (intravenous immune globulin, or IVIG)

Vaccination after Transplant

Vaccine	Recommended for use after HCT	Time post-HCT to initiate vaccine	No. of doses ^a
Pneumococcal conjugate (PCV)	Yes	3-6 months	3-4 ^b
Tetanus, diphtheria, acellular pertussis ^c	Yes	6-12 months	3 ^d
<i>Haemophilus influenzae</i> conjugate	Yes	6-12 months	3
Meningococcal conjugate	Follow country recommendations for general population	6-12 months	1
Inactivated polio	Yes	6-12 months	3
Recombinant hepatitis B	Follow country recommendations for general population	6-12 months	3
Inactivated influenza	Yearly	4-6 months	1-2 ^e
Measles-mumps-rubella (live) ^{f,g}	Measles: All children and seronegative adults	24 months	1-2 ^h

- Additional recommendations:
 - Shingrix x 2 doses
 - Repeat COVID19 mRNA vaccine series + boosters (4 total doses)

Risks of Other Cancers

- Difficult to study/uncertainties:
 - effects of prior cancer/therapy vs effects of transplant vs maintenance therapy
- Follow normal cancer screening guidelines for your age:
 - Mammograms (start at age 25 if chest radiation)
 - Pap smears
 - Colon cancer screening
 - Skin exams
 - Oral cancer screening
- Avoid smoking and protect from sunburn

Other problems

- Thyroid gland dysfunction (low thyroid levels)
 - ~10% risk
 - Monitor thyroid levels; thyroid hormone replacement is safe and straightforward
- Peripheral neuropathy
 - Usually related to pre-transplant therapy (e.g., bortezomib or brentuximab)
 - Gabapentin often prescribed; consider duloxetine

Other problems

- Cataracts
 - Exacerbated by steroid use (myeloma therapy)
 - Maintain routine eye exams
- Fatigue
- Depression/anxiety
- Cognitive dysfunction

Routine Healthcare

- Close attention to cardiovascular risk factors
 - Cholesterol
 - Diabetes
 - Exercise and body weight
- Bone health
 - Vitamin D and calcium intake
 - Follow primary care guidelines for DEXA screening + treatment of osteoporosis
 - Treat osteoporosis if diagnosed

Fertility after Autologous Transplant

- Most female patients are post-menopausal after transplant
- Fertility **depends** on age and prior therapy
- Minority of younger female patients recover ovarian function
 - Absence of menses does not mean infertility
 - Seek ob/gyn consultation if you wish to become pregnant
 - There does not appear to be an increased risk to the health of the mother or baby after transplant
- Male fertility is variable

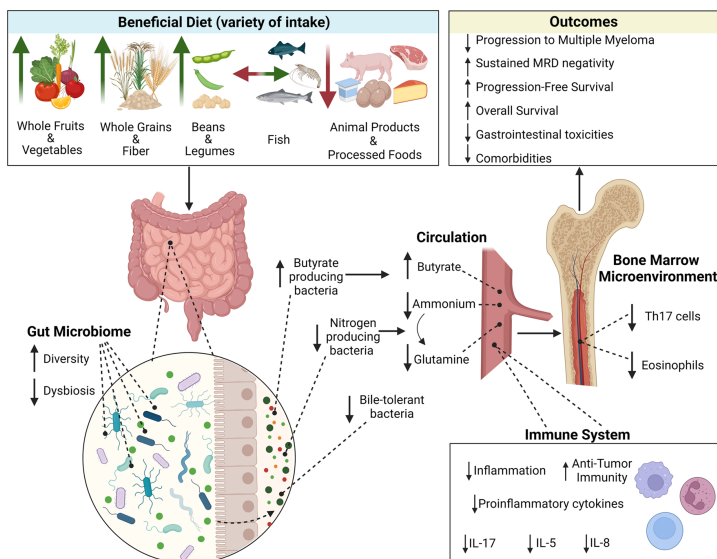
Fertility preservation

- Female
 - Egg harvesting or embryo storage prior to therapy
 - May not be feasible or safe prior to starting chemotherapy
- Male
 - sperm banking is usually feasible prior to starting chemotherapy

Sexual Health

- Both men and women report less sexual activity after transplant than expected for age
- Reported reasons for lower activity among sexually active patients were...
 - reduced sexual function:
 - erectile dysfunction for men (38%)
 - vaginal dryness for women (63%)
 - reduced interest (55% of women, 23% of men)

Emerging Effects of Diet on Late Post-Transplant Myeloma Control

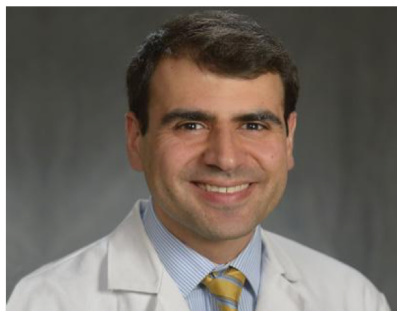


Summary

- Most patients return to prior quality-of-life after autologous SCT
- Patients may have long-term impairments in “immune health.”
- Common health problems include reduced sexual health, low bone density, and infections.
- Important interventions include vaccinations, returning to routine primary care including cancer screenings, and measures to address sexual health.
- Emerging role for plant-based diet to potentially improve long-term myeloma control.

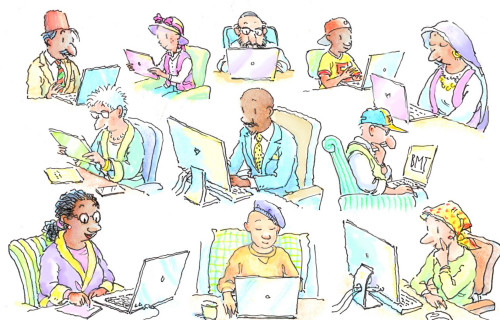


QUESTIONS?



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