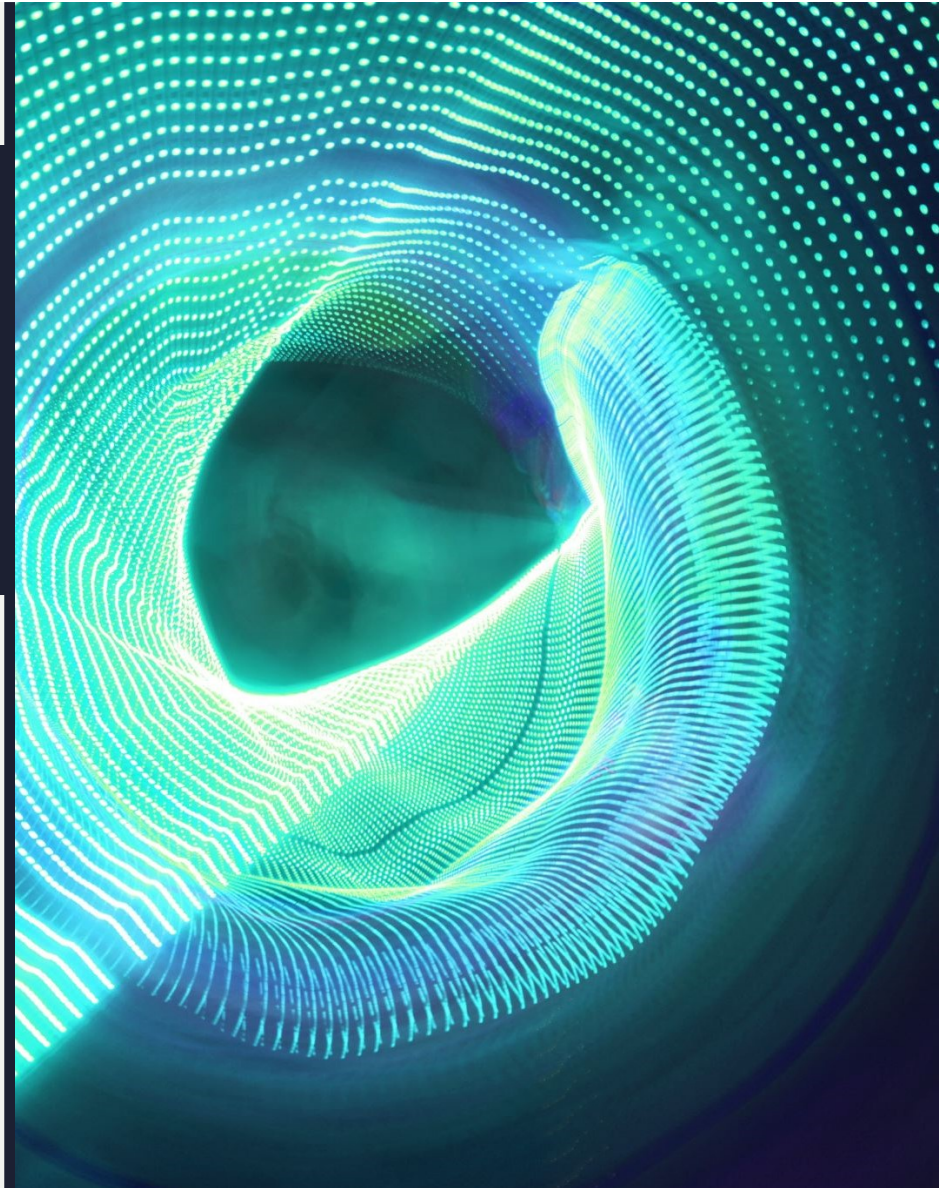


SURVIVORSHIP IN BLOOD AND MARROW TRANSPLANT

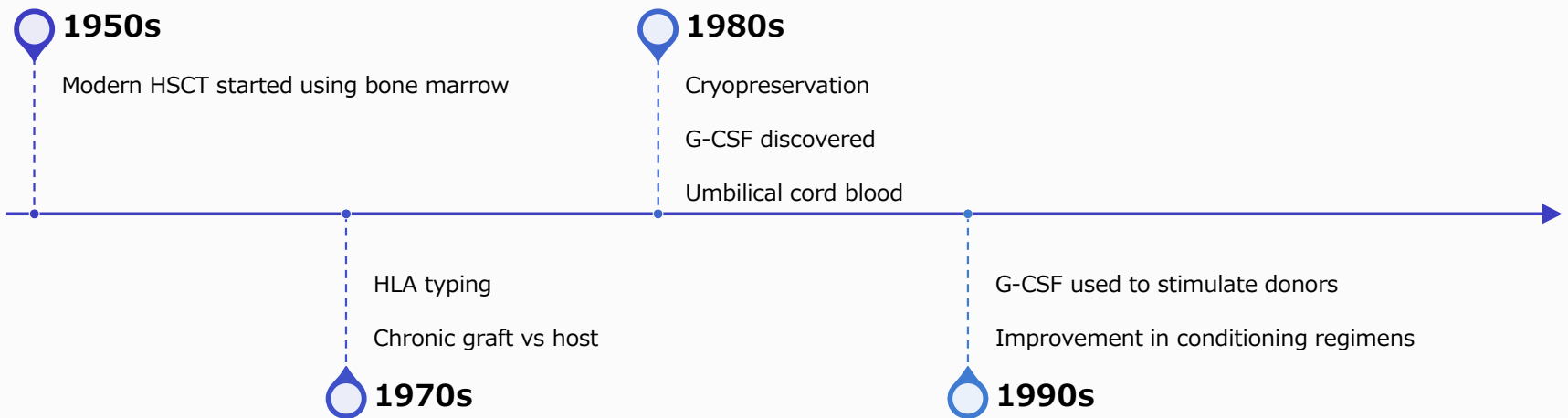
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Objectives

- **Types of hematopoietic stem cell transplants (HSCT)**
- **Long term complications of HSCT**
- **Survivorship issues in HSCT**

HSCT



Types of HSCT

TYPES

- Allogeneic
- Autologous
- Syngeneic

SOURCES

- Marrow
- Peripheral
- Umbilical

Late Complications & Survivorship Issues

- **Late – 6 months (180 days)**
- **Complications from pre-transplant & transplant related exposures.**
- **Risk factors:**
 - Age
 - Gender
 - Transplant type
 - Graft vs Host disease (GVHD)
 - Corticosteroid exposure / use
 - Total body irradiation (TBI)
- **Broadly Infectious and noninfectious**

Infectious Survivorship Concerns

- **Risk factors**
 - Donor source
 - HLA mix-match
 - T-cell depleted vs repleted
 - GVHD
 - Immunosuppression
- **Viral infection reactivation**
 - CMV
 - cGVHD
 - Immunosuppression / Steroids
- **Encapsulated organisms**
 - Endocarditis prophylaxis
 - cGVHD
 - Immunosuppression / Steroids
- **Immunizations**
 - Per guidelines

Noninfectious Survivorship Concerns

- **Ocular**
 - Cataracts
 - Sicca Syndrome
 - Microvascular Retinopathy
- **Oral**
 - Sicca Syndrome
 - Xerostomia
 - Dental Caries
 - Oral Cancer (SCC)
- **Respiratory**
 - Interstitial pneumonitis
 - Bronchiolitis obliterans
 - Cryptogenic pneumonia
 - Sinopulmonary infections
- **Cardiovascular**
 - Cardiomyopathy (CM)
 - Congestive heart failure (CHF)
 - Arrhythmias
 - Cerebral vascular disease
 - Coronary artery disease (CAD)
 - Peripheral arterial disease (PAD)
- **Hepatic**
 - cGVHD
 - Hepatitis B & C
 - Iron overload
- **Renal / GU**
 - CKD
 - Bladder dysfunction
 - Recurrent UTI

Noninfectious Survivorship Concerns

- Muscular / Connective Tissue
 - Myopathy
 - Fasciitis / scleroderma
 - Polymyositis
- Skeletal
 - Osteopenia / Osteoporosis
 - Avascular Necrosis
- Nervous System
 - Leukoencephalopathy
 - Cognitive deficits
 - Calcineurin Neurotoxicity
 - Peripheral Neuropathy
- Secondary Malignancies
 - Solid Tumors
 - Hematological
- Endocrine
 - Hypothyroidism
 - Hypoadrenalism
 - Hypogonadism
 - Growth Retardation
- Integumentary & Mucus Membranes
 - Cutaneous Sclerosis
 - Genital cGVHD
- Psychosocial
 - Anxiety
 - Depression
 - Fatigue
- Sexual Dysfunction & Infertility
- General Population Health Prevention

Non-infectious

OCULAR

- Cataracts
 - Almost all patients myeloablative TBI
 - 40-70% fractionated TBI
 - 5-10% non TBI
 - Corticosteroid use
- Sicca syndrome
 - Usually part of generalized syndrome
 - cGVHD
- Microvascular Retinopathy
 - Allogeneic HSCT
 - Radiation

SURVIVORSHIP ISSUES

- Needs ocular exam at 6 mo & 1 yr
- Yearly after
- Sooner if symptoms develop or cGVHD

ORAL

- Sicca syndrome
 - Usually part of generalized syndrome
 - cGVHD
- Dental Caries
- Oral malignancy

SURVIVORSHIP ISSUES

- Needs oral exam at 6 mo & 1 yr
- Yearly after
- Pediatric – monitor tooth development
- Sooner if symptoms develop or cGVHD

Non-infectious

RESPIRATORY

- Interstitial pneumonitis
 - Noninfectious diffuse interstitial pulmonary infiltrates
- Bronchiolitis obliterans
 - Dx:
 - cGVHD
 - $FEV_1/FVC < 0.7$ and $FEV_1 < 75\%$ of predicted
 - CT: Air trapping / small airway thickening / bronchiectasis / residual volume $> 120\%$ / constrictive bronchiolitis
 - No infection
- Cryptogenic pneumonia
 - BL Patchy infiltrates / IS: restrictive / More distal than bronchiolitis obliterans / Better response to steroids
- Sinopulmonary infections
 - Delayed immune reconstitution

SURVIVORSHIP ISSUES

- Clinical evaluations at 6 mo and 1 yr, then yearly. Sooner if needed or if cGVHD.
- PFTs & Radiological evaluation
- Tobacco use assessment and counseling

Non-infectious

CARDIOVASCULAR

- CM
- CHF
- Arrhythmias
- Cerebrovascular disease
- CAD
- PAD

SURVIVORSHIP ISSUES

- Yearly assessment of CV risk factors
- Symptomatic and at-risk patients - EKG / echocardiogram
- Fasting lipids
- Fasting blood sugar
- Lifestyle education
- Treatment of risk factors (DM, HTN, dyslipidemia)
- Endocarditis ppx

Non-infectious

HEPATIC

- cGVHD
- Hepatitis B & C
- Iron overload

SURVIVORSHIP ISSUES

- LFTs 3 – 6 months for first year, then yearly after that (sooner if abnormal)
- Known HBV or HCV – monitor viral load by PCR.
- Chronic HCV – liver bx at 8 – 10 years to evaluate for cirrhosis
- Check ferritin at 1-year, abdominal MRI if abnormal.

Non-infectious

RENAL / GU

- CKD
 - Multifactorial
- Bladder dysfunction
 - History of hemorrhagic cystitis ± BK virus
- Recurrent UTI
 - cGVHD

SURVIVORSHIP ISSUES

- Blood pressure assessment
- Aggressive management of hypertension
- Renal function (BUN, s Creatinine, urine protein) at 6 mo & 1 yr, then yearly after. Sooner if necessary.
- Early evaluation of abnormal / worsening renal function.

Non-infectious

MUSCULAR & CONNECTIVE TISSUE

- Myopathy
 - Chronic steroid use / cGVHD
 - Proximal LE muscles
- Fasciitis / scleroderma
 - cGVHD
 - Leads to contractures
- Myositis / Polymyositis
 - 2 – 5 years post transplant
 - Moderate / Severe proximal muscle weakness & myalgia
 - Elevated creatinine kinase, myopathic pattern on EMG & perifascicular lymphocytic infiltration on bx.

SURVIVORSHIP ISSUES

- cGVHD / chronic steroid use: frequent muscle test, physical therapy
- Assess ability to go from sitting to standing

Non-infectious

SKELETAL

- Osteoporosis / osteopenia
 - 25-50% of patients
- Avascular necrosis
 - 4 – 10%
 - Joint pain

SURVIVORSHIP ISSUES

- Adult women, allo-HSCT and high risk: Dual-photon densitometry at 1 year
 - cGVHD / chronic steroids or calcineurin inhibitor - earlier
- Encourage physical activity, vitamin D & calcium to prevent bone loss
- Joint pain should be imaged with MRI

Non-infectious

NEUROLOGICAL

- Leukoencephalopathy
 - cGVHD
- Cognitive deficits
- Calcineurin Neurotoxicity
- Peripheral Neuropathy
- Cognitive delays – children

SURVIVORSHIP ISSUES

- Changes are often subtle and can be difficult to detect.
- Clinical evaluation at 1 year, then yearly
- Pediatric patients: Annual assessments for cognitive development & milestone benchmarks

Non-infectious

NEUROLOGICAL

- Leukoencephalopathy
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- Clinical evaluation at 1 year, then yearly
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Non-infectious

ENDOCRINE

- Hypothyroidism
- Hypoadrenalism
- Hypogonadism
- Growth Retardation
 - Highest risk in children <10 yrs.

SURVIVORSHIP ISSUES

- Thyroid function yearly, sooner if symptoms develop
- Post-pubertal women: Gonadal assessment at 1 year then annually depending on menopause state.
 - Higher rate of ovarian failure.
- Men: FSH, LH, testosterone if symptoms develop
- Pediatric: Referral to endocrinology if girls do not achieve puberty by 12-13 years

Non-infectious

INTEGUMENTARY & MUCUS MEMBRANES

- Cutaneous Sclerosis
 - cGVHD – lichen planus-like or papulosquamous lesions, sclerosis, poikiloderma, skin ulcers, alopecia, nail dystrophy, skin dyspigmentation
- Genital cGVHD
 - 12% of women
- Skin cancer

SURVIVORSHIP ISSUES

- Avoid excess sun exposure
- Routine skin evaluations
- Annual gynecological evaluations – more frequent if cGVHD or TBI

Non-infectious

SECONDARY MALIGNANCIES

- Solid Tumors
- Hematological Malignancies

SURVIVORSHIP ISSUES

- Self examination
 - Skin
 - Breast
 - Testicles
- Avoid high risk behaviors (smoking, sun exposure)
- Mammography:
 - Age 25 or 8 years after radiation exposure (TBI & chest radiation)
 - No later than age 40
- Follow population-based screening recommendations for colon cancer & pap
- cGVHD: yearly oral examinations for oral / pharyngeal cancer

Non-infectious

PSYCHOSOCIAL

- Anxiety
- Depression
- Fatigue

SURVIVORSHIP ISSUES

- Clinical assessment through out HSCT process
 - Full assessment at 6 mo and 1 year, then yearly. Sooner if needed.
- Encourage support networks
- **Assess for caregiver fatigue**

Non-infectious

SEXUAL DYSFUNCTION & INFERTILITY

- Physical Sexual Problems
 - ED - ~47% men
 - Dryness ~ 60% women
 - Inability to orgasm
 - Depression -> inability for arousal in women
- Infertility

SURVIVORSHIP ISSUES

- Assess at 6mo, 1 year and annually
- Infertility – refer to specialist. Check FSH, LH levels.

Non-infectious

GENERAL POPULATION HEALTH

- All survivors should be screened for:
 - Dyslipidemia
 - DM
 - HTN
 - Mood disorders
- Lifestyle recommendations:
 - Healthy diet
 - Smoking avoidance / Cessation
 - Healthy weight
 - Avoiding excess sun
 - Use of sunscreen

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