

Transplantation

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Transplantation

- Transfer of living tissue
- Cells: stem cells, blood cells – platelets, ...
- Tissue: blood, bone marrow, skin, bone, cartilage, cornea, vessel, heart valve, fat tissue
- Organ: kidney, heart, lung, liver, pancreas, small intestine, uterus, spleen, ovary
- Body parts: hand/upper limb, face

Types of transplantations

- The four major types of grafts are:
 - Autografts – graft transplanted from one site on the body to another in the same person (skin, vessel, blood, ovary, heart valve)
 - **Isografts – grafts between identical twins** (1. successful transplantation – kidney 1954)
 - Allografts – transplants between individuals that are not identical twins, but belong to same species (human-human), most common
 - Xenografts – grafts taken from another animal species (skin, heart valves; pig-human)

Types of transplantations - localization

- **Heterotopic:** to a different position (kidney into pelvic region, pancreatic islets into mesenterium), the recipient's own organ remains in its place
- **Orthotopic:** to the same anatomic position
 - Necessity of prior removal of the recipient's own organ (heart, lung, liver) – explantation
 - Implantation of the donor organ (graft)

Types of transplantations

- Combined organ transplantations possible, many combinations
 - Heart + kidney
 - Heart + lungs
 - Heart + liver + kidney
 - Liver + kidney + pancreas + intestine + spleen

Organ transplantation

- Treatment of end-stage organ failure
 - Temporary/auxiliar functional replacement (uterus, liver)
 - Waiting list normal /urgent
 - Cadaver donor most common
 - Living donor for kidney, part of the liver, skin, ...
 - Selection of most suitable donor and recipient - ABO-system most important
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- Ultimate goal: most possible immunologic tolerance

Organ transplantation problems

- Shortage of available and suitable organs
- Preservation of donor organs (time outside the blood circulation)
- Surgical techniques of transplantation
- Immunosuppression therapy to prevent rejection
- Diagnosis of possible rejection, infections, surgical complications

Posttransplantational complications

- Ischemic injury (stop of blood flow), reperfusion injury (after implantation)
- Rejection, GVHD – graft-versus-host-disease (bone marrow transpl.)
- Immunosuppression complications (opportunistic infections, neoplasia – 100x increased incidence; drug cytotoxicity)
- Other complications (surgical, original disease recurrence)
- Organ retransplantation sometimes possible

Organ transplantation problems

- **Rejection:** complex immunologic process, cellular and humoral reaction
- **Factors** – genetic diversity, type of tissue (vascularisation, number of antigen presenting cells), host immune system activity (immunosuppression), graft condition
- Rejection in reaction on presence (+ demasking grade) of foreign antigens
- Hyperacute, acute, chronic rejection

Opportunistic infections

- Risk due to acquired immunodeficiency
- Viral – activation of opportunistic microorganisms – cytomegalovirus CMV, Epstein-Barr virus EBV
- Mycotic – ubiquitous fungi (aspergillus)
- Bacterial – TB, common bacteria
- Parasitic - toxoplasma

Organ transplantation and exercise, activity

- Postoperatively:
 - Long recovery period
 - Side effects of long-term immunosuppression
 - Diabetes mellitus, accelerated hyperlipidemia
 - Lifelong changes – drug compliance, diet changes, ...

Organ transplantation and exercise, activity

- Before transplantation: long term poor health, severe deconditioning, exercise intolerance
- Pretransplantation activity necessary to maintain function
- Training to maintain/increase muscle strength before adverse effects of steroid therapy

Organ transplantation and exercise, activity

- Immediate start of physical therapy after transplantation necessary
- Various training programs – aerobic, muscle endurance, resistive training
- Improved quality of life
- Persistent limitations common (decrease in workload, earlier onset of anaerobic threshold, lower exercise capacity)
- Denervation of transplanted organs – loss of autonomic response (heart, kidney); no problems in liver
- Lungs – delay in bronchodilatation – longer warm-up period necessary

Organ transplantation and exercise, activity

- Musculoskeletal effects: osteoporosis, vertebral fractures, myopathies
- Neurotoxic reactions: tremor, paresthesia
- GIT problems
- Decreased wound healing

Hematopoietic cell transplantation – implications for the therapist

- Treatment of hematologic neoplasias (leukemia, lymphoma, myeloma)
- Non-neoplastic blood disorders (bone marrow failure – aplastic anemia, inborn severe combined immunodeficiency)

Hematopoietic cell transplantation – implications for the therapist

- Short and/or long-term complications – 30% lower life expectancy
- Immunodeficiency
- Loss of immune memory (vaccines, after infections, ...)
- Bone marrow failure
- Sterility
- Neurocognitive impairment
- Cardiopulmonary toxicity
- Graft-versus-host disease

Hematopoietic cell transplantation – implications for the therapist

- Assessment of past life/medical history,
 - Prior level of function/exercise/activities
 - Assessment of general/specific condition
 - Knowledge of specific medical regimen
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- Risk for immobility, pneumonia, pressure ulcers, muscle weakness
 - Skin care
 - Oral mucositis

GVHD, implications for the therapist

- GVH disease occurs in any situation in which immunologically competent cells or their precursors are transplanted into immunologically crippled recipients, and the transferred cells recognize alloantigens in the host
- May be fatal
- Most important complication of hematopoietic cell transplantation

Graft-versus-host disease

- In most patient with bone marrow transplantation, possible in organs with higher amount of lymph. tissue – intestine, liver (immunologic competent T cells + precursors → in immunodeficient host)
- HLA typization necessary
- **hyperacute** 7-14 d., fever, generalized erythrodermia
- **acute** –skin rash, mucosal ulceration, liver cholestatic lesions, thrombocytopenia, anaemia
- **chronic** – chron. lichenoid lesions + atrophy of skin, mucosa, bronchiolitis obliterans, chron. hepatitis,...

GVHD



Graft-versus-host disease

- Possible signs observed by the therapist:
 - Progressive dyspnea
 - Heart palpitations
 - Chest pain
 - Increasing fatigue
- Neuromusculoskeletal problems
 - Generalized polyneuropathy
 - Muscle wasting
 - Joint pain + stiffness, contractures (in chronic GVHD)
 - Deep tendon reflexes changes