

نام خداوند بخشنده مهربان



PREOPERATIVE EVALUATION

NEUROLOGIC DISEASE

MUSCULOSKELETAL & CONNECTIVE TISSUE DISEASES

CANCERS & TUMORS

PATIENTS WITH:

Pseudocholinesterase Deficiency- Malignant Hyperthermia, Morbidly Obese ,
Transplanted Organs, Allergies, Substance Abuse, HIV Infection , Breastfeeding, Do
Not Resuscitate Orders

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NEUROLOGIC DISEASE

- **Cerebrovascular Disease**
- **Asymptomatic Carotid Bruit**
- **Seizure Disorder**
- **Multiple Sclerosis**
- **Parkinson Disease**
- **Neuromuscular Junction Disorders**
- **Muscular Dystrophies and Myopathies**
- **Myotonic Dystrophies.**
- **Central Nervous System Tumors**

MUSCULOSKELETAL & CONNECTIVE TISSUE DISEASES

- Rheumatoid Arthritis
- Ankylosing spondylitis
- Systemic Lupus Erythematosus

CANCERS & TUMORS IN PREOPERATIVE PATIENTS

- **Patients With Cancer**
- **Mediastinal Masses**
- **Carcinoid Tumors**

Special Issues in Preoperative Evaluation

- **BREASTFEEDING PATIENTS**
- **MORBIDLY OBESE PATIENTS**
- **PATIENTS WITH TRANSPLANTED ORGANS**

Cerebrovascular Disease

- The major clinical manifestation of CVD is acute STROKE & TIA
- The two main categories of stroke are **HEMORRHAGIC** STROKE (intracerebral hemorrhage or subarachnoid hemorrhage). and **ISCHEMIC** STROKE.
- Common causes of:
 - ICH → HTN , Trauma, Coagulopathies, Drug Use (Amphetamines, Cocaine), AVMs
 - SAH → bleeding from Aneurysms and AVMs
 - **ISCHEMIC** Stroke → **Thrombosis** of an artery , **Embolism** , or **Systemic Hypoperfusion** (cardiac arrest).
- CVD is a **risk factor** for postoperative complications, including **Cardiac Events**, **Stroke**, **Death**.
 - Risks of post-operative **cardiac complications** and **recurrent stroke** are increased
 - **When** **Elective noncardiac surgery** is performed **within 9 months** after a prior stroke **OR**
 - **When** **surgical Aortic Valve Replacement** is performed **within 3 months** after a prior stroke.

Cerebrovascular Disease

- **If Emergency Surgery** needs to be performed after a stroke, it may be preferable **to not delay surgery**. Specifically, while the risks of postoperative cardiovascular complications are very high when emergency surgery is performed **within 2 weeks** after an ischemic stroke, *these risks were reduced When surgery proceeded within 72 hours after the stroke.*

Count ...Cerebrovascular Disease

□ The Preoperative Evaluation

should focus on the timing, presentation, etiology, and treatment of prior strokes or TIAs.

- Depending on the underlying basis for CVD (atherosclerosis, AF), patients may be on long-term therapy with Aspirin, P2Y12 inhibitors (Clopidogrel), vitamin K antagonists, DOACs.(Direct Oral AntiCoagulats)
 - Both vitamin K antagonists & DOACs **should be** temporarily **discontinued** before surgery .
 - P2Y12 inhibitor therapy **should be interrupted** before surgery, with the possible exception of cases with very recent coronary stent implantation.
 - Continuing ASPIRIN perioperatively **does not** prevent cardiovascular complications, but leads to an increased risk of major bleeding (a risk factor for perioperative stroke).
 - **selective continuation** of ASPIRIN can be considered in patients **with high-risk atherosclerotic CVD or recent stroke (previous 9 months)**.
 - In other cases, **ASPIRIN** **should be** temporarily held **72 hours** before surgery.

- **Asymptomatic Carotid Bruit** →

- The presence of a carotid bruit → increases the likelihood of a significant lesion (70%-99% stenosis) in both symptomatic or asymptomatic Pts. → a newly discovered carotid bruit **should prompt** → search for any evidence of prior strokes or TIA, especially if the planned surgical procedure involves neck manipulation. → specifically inquire about *amaurosis fugax*, dysphagia, dysarthria, and other symptoms of cerebrovascular insufficiency.
- **Carotid Doppler ultrasound studies** are simple, effective tools to evaluate suspicious carotid bruits.
 - Significant abnormalities on Doppler → referral to a Neurologist /Vascular surgeon.
- **The risk of stroke** in patients who have **truly asymptomatic bruits** is **1% to 2% per year**, with most strokes preceded by transient symptoms.
- **No evidence indicates that truly asymptomatic bruits increase the risk of *perioperative* stroke**

Seizure Disorder

- The seizure type (*grand mal*, absence) and specific symptoms (staring, focal findings) are important to document in the preoperative evaluation.
- typical symptoms, such as staring and obtundation, may be misinterpreted as residual anesthetic effects in the postoperative period.
- The anesthesiologist **should** document the anticonvulsant dosing regimen and adequacy of seizure control.
- Routine measurement of serum drug levels of anticonvulsants **is not indicated** unless there are concerns about drug toxicity or ongoing breakthrough seizures.
- The most commonly ordered tests are **CBC** and **Electrolyte Concentrations**.
- All anticonvulsant therapy **should be** continued perioperatively.
- A patient with poorly controlled or new-onset seizures **should be** evaluated by a neurologist before any non-emergent surgery.

Multiple Sclerosis

- ✓ Multiple sclerosis is believed to be an **inflammatory immune disorder** with two general clinical patterns:
 - Exacerbating Remitting
 - Chronic Progressive.
- ✓ **Symptoms** → ataxia, motor weakness, sensory deficits, autonomic dysfunction, emotional lability, bladder or bowel dysfunction, visual disturbances.
- ✓ Exacerbations of MS → can be triggered by **stress, infections, pregnancy, and elevated temperatures**.
- Various treatments have been tried, including corticosteroids, immune suppressants, monoclonal antibodies, plasmapheresis, benzodiazepines, and baclofen.
- ✓ The preoperative evaluation should document the Hx & pattern of disease, & physical deficits affecting the respiratory system (SatO₂).

Multiple Sclerosis

➤ Testing is generally directed toward associated disturbances & Medication

IF pulmonary infection is suspected → CXR and CBC ,

IF corticosteroids → can cause hyperglycemia (FBS)

IF azathioprine → can suppress bone marrow (CBC) or affect liver function (LFT),

IF cyclophosphamide → electrolyte abnormalities (Electrolyte).

✓ Patients with stable minor disease require no special testing.

✓ Related medications should be continued on the day of surgery.

✓ No clear association has been shown between the type of anesthetic or a specific anesthetic drug and disease exacerbations.

✓ Regional Anesthesia may offer theoretical **advantages** for patients with **respiratory** compromise or **cognitive dysfunction**.

Parkinson Disease

- ❑ **Parkinson disease** is a degenerative disorder of the basal ganglia characterized by **failure** of **dopamine secretion** and diminished inhibition of the extrapyramidal motor system.
- ❑ Patients typically have **diminution** of **spontaneous movements**, **rigidity** (**cogwheel rigidity** is classic), **resting tremor**, **masked facies**, **difficulty speaking**, difficulty walking, depression, and dementia.
- ❑ **Autonomic dysfunction**(orthostatic HTON), excessive salivation, impaired thermoregulation may occur.
- ❑ Patients are at risk of **pulmonary complications** (difficulty swallowing, altered mental status, ventilatory muscle dysfunction.)
- ❑ Pharmacologic treatments include levodopa (can cause dyskinesias), dopamine agonists, & ...
- ❑ Some individuals → **implantation** of **Deep Brain Stimulators** → require deactivation of the devices before any procedures in which electrocautery will be used → should be coordinated with the surgeon & the clinician managing the device.

Parkinson Disease

- ❑ All associated medications should be continued.
- ❑ Some medications, such as Metoclopramide & Phenothiazines, may exacerbate symptoms of Parkinson disease by interfering with dopamine.
- ❑ Pre-op evaluation should assess the pulmonary system, signs of dysphagia, degree of disability → significant pulmonary symptoms or possible infection → CXR , Pulmonary consultation, possible delay of the procedure for improvement

Neuromuscular Junction Disorders

▶ Myasthenia gravis

- **Myasthenia gravis** is an **autoimmune** disorder of **skeletal muscle neuromuscular junctions** that is caused by antibodies against **nicotinic acetylcholine receptors**.
- The disease is characterized by **skeletal muscle weakness** that **worsens with activity** and **improves with rest**.
- Weakness is exacerbated by **stress**, **infections**, **hypokalemia**, **medications** (**aminoglycosides**, **propranolol**, **ciprofloxacin**, **clindamycin**), and **surgery**.
- Cardiac and smooth muscle function is unaffected.
- A classification system for severity of myasthenia gravis ==>

▶ Lambert-Eaton syndrome

BOX 31.13 Osserman Classification System for Myasthenia Gravis Clinical Classification System

Class I: Ocular myasthenia

Class IIA: Mild generalized myasthenia with slow progression: no crises, responsive to drugs

Class IIB: Moderately severe generalized myasthenia: severe skeletal and bulbar involvement but no crises; drug response less than satisfactory

Class III: Acute fulminating myasthenia: rapid progression of severe symptoms, with respiratory crises and poor drug response

Class IV: Late severe myasthenia, same as III but progression over 2 years from class I to II

Data from Osserman KE, Genkins G. Studies in myasthenia gravis: review of a twenty-year experience in over 1200 patients. *Mt Sinai J Med.* 1971;38:497-537.

Count... Myasthenia gravis

- These patients commonly have other autoimmune diseases, (Rheumatoid Arthritis, Polymyositis, Thyroid Disorders.)
- **Ocular symptoms** (**diplopia**, **ptosis**) **are almost always present**; (often, the presenting complaint or sole complaint)
- Cranial nerve and bulbar involvement are common, with an associated **aspiration risk** related to pharyngeal and laryngeal muscle weakness.
- Affected individuals **may** have thymic hyperplasia and tumors.
- **Patients are usually treated** with:
 - Thymectomy,
 - Acetylcholinesterase Inhibitors (Pyridostigmine, Neostigmine),
 - Immuno-suppressants (Corticosteroids, Azathioprine, Mycophenolate, Cyclosporine),
 - Plasmapheresis,
 - Intravenous Immunoglobulins

Count... Myasthenia gravis

- Worsening symptoms may reflect:
 - worsening disease (**Myasthenic Crisis**)
 - excessive acetylcholinesterase inhibitor treatment (**Cholinergic Crisis**).
- A short-acting anticholinesterase (**Edrophonium**) can help distinguish the two states, since only a myasthenic crisis improves with more anticholinesterase.
 - **Plasmapheresis** and **intravenous immunoglobulins** have been used to treat **Myasthenic Crises** and prepare patients for surgery, but still require several days to weeks to produce improvement.

Count... Myasthenia gravis

- All medications (with associated doses) **should be** documented and continued perioperatively.
 - patients taking azathioprine require a **CBC** and **LFT** (drug-induced bone marrow suppression and liver dysfunction.)
 - Patients taking corticosteroids need measurement of **FBS/BS** , & possible Peri-op **corticosteroid supplementation**.
- Pre-op **PFTs** may also be indicated , (those suspected of having severely affected ventilator function. **AND** particularly helpful if patients are being considered for **ambulatory surgery**
- Drugs that can exacerbate myasthenic symptoms should also be avoided.(**aminoglycosides**, **propranolol**, **ciprofloxacin**, **clindamycin**),

Lambert-Eaton syndrome

- is similar to MG, with **muscle weakness** including oculobulbar involvement & dysautonomia.
- **caused by Ab against voltage-gated calcium channels** → result in ↓acetylcholine **release**.
- It is **not** associated with **thymic abnormalities**, **BUT** commonly occurs with malignant diseases, especially **small cell lung cancer** and **GI tumors**.
- **The other distinguishing feature of this disorder** → muscle weakness **classically improves with activity** and is **worse after inactivity**.
- Rx : acetylcholinesterase inhibitors, 3,4-diaminopyridine (a selective potassium channel blocker.)
- **Preoperative Evaluation** and management are similar to those for MG.
- All related medications **should be** continued perioperatively.

Muscular Dystrophies and Myopathies

- Muscular Dystrophies & Myopathies are inherited disorders that affect the **neuromuscular junction**.
- **The hallmark** of these disorders is **progressive skeletal muscle weakness** that commonly leads to **respiratory failure**. No effective therapy is available.
- Many individuals have associated **Cardiomyopathies** & **possible Malignant Hyperthermia**.
- **Duchenne & Becker** muscular dystrophies are **X-linked recessive** disorders ==> primarily in **males**.
- Affected individuals have **elevated CPK levels**, often preceding the onset of symptoms.
- **Male patients** with a family Hx of either Duchenne or Becker muscular dystrophy **should be** considered at risk, and they require precautions similar to those in patients with diagnosed disease.
- **Cardiomyopathy and respiratory failure are the usual causes of death**.
- **Female carriers** of the abnormal gene may have Dilated CMP (no other manifestations of the disease.)
- **The preoperative evaluation** should focus on the **cardiovascular** (palpitations, dyspnea, chest pain, syncope, orthopnea, dependent edema) and **pulmonary** (aspiration, pneumonia) systems. ➔ Potentially helpful preoperative tests include **ECGs, PFTs, Echocardiography**

Myotonic Dystrophies.

- **Myotonia** is characterized by **prolonged contraction and delayed relaxation of muscles**.
 - including: **classic Myotonic dystrophy** (**the most common**), congenital myotonic dystrophy, (**severe form**) myotonia congenital, central core disease.
 - **The classic findings** are **severe muscle wasting**, (typically Diaphragm, Face, Hands, Pharynx, Larynx.)
 - **Cold temperatures** can often trigger myotonia.
 - **Symptoms** often not apparent until the **second or third decade** of life;==> FHx is important.
 - **Cardiomyopathies** , **Arrhythmias**, **Conduction Abnormalities** are **common**, some patients also have cardiac VHD.

- Cardiac involvement **may not correlate** with the degree of atrophy or weakness in skeletal muscle.
- **Once an affected individual shows any evidence of second- or third-degree AVblock, a pacemaker should be implanted** (even if the patient is **asymptomatic**) because an unpredictably rapid progression of conduction disease may occur..
pacemaker placement may be considered in **patients with first-degree AV block**, regardless of symptoms.
 - also at risk for aspiration, pneumonia, respiratory failure, & postoperative pulmonary complications
 - Myotonia was historically thought to predispose patients to malignant hyperthermia, however, current evidence indicates that they are **not** at increased risk.
- **Nonetheless, succinylcholine should still be avoided in these patients** because it may cause diffuse muscle contraction.

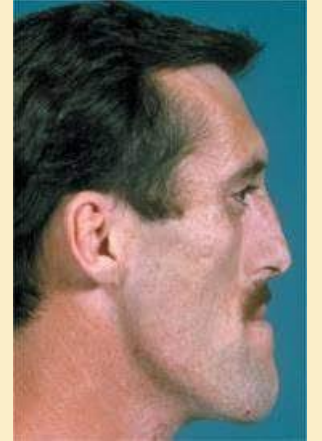
- **The preoperative evaluation** focuses on the cardio pulmonary system, with special emphasis on evaluating for pulmonary infection, heart failure, syncope, conduction abnormalities, and valvular abnormalities.
- **Preoperative testing** includes : **ECG, Echocardiogram CXR** (if symptoms of pulmonary disease).
- Evidence of a conduction abnormality on ECG **should** trigger a **cardiology consultation**.
- Myotonia **is not inhibited** by Regional Anesthesia, **BUT** local anesthetic **infiltration** into muscle **may** provide symptomatic relief.

Central Nervous System Tumors

- **Pituitary tumors** are classified as
 - Functioning (associated with endocrine abnormalities) **Vs** Nonfunctioning
 - Benign (adenomas are the most common pituitary lesion) **Vs** Malignant.
- The tumor can have mass effects → headaches, visual field defects, increased ICP (with resulting gait disturbances, vomiting, cranial nerve deficits, bladder incontinence, bowel incontinence).
- Other symptoms may be related to
 - pituitary insufficiency (hypoadrenalism, hypothyroidism, infertility)
 - over activity. → Manifestations of pituitary over activity include:
 - Cushing syndrome from ACTH-secreting tumors;
 - Acromegaly from growth hormone secretion;
 - Hyperthyroidism from TSH production;
 - Gynecomastia, lactation,
 - Sex hormone-related changes from Prolactin and Gonadotropin (FSH and LH) secretion.

Acromegaly

- Results in enlargement of connective tissue, bone, and visceral organs. .
- Affected individuals have an enlarged jaw (**macrogathia**), nose, feet, hands, pharyngeal tissue, and laryngeal tissue (**macroglossia & enlarged epiglottis**).
- Increased risks of **sleep apnea** (both central & obstructive), **Neuropathies** (from nerve entrapment), **HTN**, diastolic dysfunction, **cardiac valvular abnormalities**.
- IHD, heart failure, DM, hypothyroidism, difficult airway management (mask ventilation, laryngoscopy, intubation) may also occur.



Acromegaly

- ❑ **The Preoperative Evaluation should** document any chest pain, dyspnea, snoring, numbness, polydipsia, headaches, visual disturbances. AND blood pressure, airway examination, murmurs, neurologic findings, and peripheral edema.
- It is important to plan for **possible difficult airway management** and inform the patient about the possible use of awake fiberoptic intubation.
- **Preoperative Testing : ECG , Electrolyte & Glucose concentration, & Thyroid Function Tests.** (↑TSH → ↑ T3 & T4 by the thyroid gland.)

Posterior Pituitary Tumors result in **failure to secrete vasopressin** or **ADH**, which regulates renal water excretion. ➔ results in **Diabetes Insipidus**,

- Unless treated with DDAVP, these patients may develop **Hypernatremia** and **volume depletion**.
- The anesthesiologist **should** therefore carefully evaluate patients' **Intravascular Volume Status** and blood sampling for **Electrolyte** and **Creatinine Concentrations**.
- **Patients with pituitary tumors, pituitary apoplexy** (hemorrhage into pituitary, which is associated with HTN , trauma, or pregnancy), or **previous pituitary tumor resection** may require **Hormone Replacement Therapy** (corticosteroids, thyroid replacement, DDAVP).
- These medications must not be interrupted during the perioperative period.

MUSCULOSKELETAL & CONNECTIVE TISSUE DISEASES

Rheumatoid Arthritis

- **Chronic autoimmune disorder** that primarily affects **joints**, it often also affects multiple organ systems.
- approximately **1%** of the population, and **Women** are **2 to 3 times more likely** to Men
- **Distal joints** are involved more often than proximal, often in a **symmetric** pattern.
- Joint involvement is characterized by **inflammation** that can progress to severe deformity.
- **The Temporo-Mandibular joints** and **Cricothyroid cartilage** can be involved, → limited mouth opening, hoarseness, and possible difficulties with airway management.
- Atlanto-dens subluxation and instability of the cervical spine can also occur.
- Cervical spine disease can be asymptomatic.

- **Cardiovascular manifestations** → IHD, pericardial effusions, Aortic Regurgitation, conduction abnormalities
- Symptoms of myocardial ischemia may be masked, because of impairment of functional status by concomitant joint disease. exertional dyspnea (because of heart failure) may be confused with pulmonary involvement.
- **Pulmonary manifestations** → RLD (secondary to ↓ thoracic mobility), pulmonary fibrosis, pleural effusions.
- **Increased risk of Renal Dysfunction** secondary to both vasculitis & long-term NSAID use.
- **Peripheral Neuropathy** can result from vasculitis or entrapment.
- **Anemia, leukocytosis, Thrombocytosis** (from chronic inflammation), **Thrombocytopenia** (splenomegaly) may be present
- **Rheumatoid Nodules** that may occur **subcutaneously** (usually over **extensor** joints) **or** in the **lungs**.

- **The preoperative examination must** document symptoms related to the many organ systems affected by RA.
- Special **neurologic, airway, pulmonary, and cardiovascular** systems.
- **Significant hoarseness** → **should** prompt an **evaluation** by an **Otolaryngologist** to assess the **mobility** of the vocal cords and the presence of crico-arytenoid arthritis.
- A careful history may elicit neurologic deficits, neck pain, upper extremity pain, or crunching sound with neck movement.

❑ Indications for preoperative cervical spine radiographs in AR include:

- Neurologic findings,
- Long-standing severely deforming disease,
- procedures requiring prone positioning
- manipulation of the cervical spine.

■ The specific radiographs required are

- Antero-Posterior , Lateral Cervical Spine films with Flexion, Extension, Open Mouth Odontoid

→ Significant abnormalities (**anterior atlas-dens interval >9 mm OR posterior interval <14 mm**) → **consultation** with a Neurologist or Neurosurgeon

❖ **Notably, disease duration, severity, and symptoms do not correlate with cervical spine subluxation.**

❑ Preoperative Tests

- New or worsening pulmonary symptoms **should** prompt evaluation with **pulse oximetry**, **CXR** , **PFTs**, or possibly a **Pulmonary Consultation**.
- **Muffled heart sounds, pericardial rubs, low voltage on an ECG**→suggest a pericardial effusion, → necessitates an **Echocardiogram**.
- Any suspicious **murmur** → an **Echocardiogram** .
- Because RA is associated with a **very high prevalence of IHD** → **ECGs** ± cardiac stress testing
- **Other Tests** → **CBC** & blood **Creatinine** concentrations.

❑ Preoperative Tests

- Advanced planning for management of potential difficult airways → discussion of Reg Anesthetic options AND possible awake fiberoptic intubation.
- **Medications** → Corticosteroids, Analgesics, Nonbiological Disease Modifying Agents (Methotrexate, Leflunomide, Hydroxychloroquine, Sulfasalazine) → **should be continued**,
 - ✓ **NSAIDs can be given to Stopping 2 to 3 days** before surgery.
 - ✓ **Biological Disease Modifying Agents (TNF α antagonists)** **should be Stopped** before surgery, (predispose patients to Post-op infections.) **when** treatment should be stopped ??? → best managed collaboratively with their Rheumatologist, primary care Physician, Surgeon.
- Stress-associated adrenal insufficiency may occur in patients taking preoperative corticosteroid therapy

Ankylosing Spondylitis

- Ankylosing spondylitis is a **progressive inflammatory arthropathy** that primarily affects the **spine** and **sacroiliac joints**, although peripheral joints may also be involved. It usually occurs in **males**.
- They can have **important extra-articular** manifestations → uveitis, vasculitis, aortitis, Aortic Insufficiency.
- may develop **RLD** related to pulmonary fibrosis or chest wall movement restriction (joint fixation & kyphosis)
- Kyphosis can be so extreme that patients are unable to face forward, thereby making mask ventilation, direct laryngoscopy, and intubation very difficult.

Ankylosing Spondylitis

- **Preoperative Evaluation** should focus on the **cardiovascular, pulmonary, & musculoskeletal** systems
 - physical Examination → measurement of **Oxygen saturation** on room air. (pulse oximetry)
 - The presence of a murmur → an **Echocardiogram**.
 - If ventilatory compromise is suspected or present, → **CXR & PFTs** are necessary.
 - **Medications** Analgesic & non-biological disease modifying agents (sulfasalazine) → continued preoperatively,
TNF α antagonists (when???) & **NSAIDs** stopped 2 to 3 days before surgery.
 - **Peripheral Nerve Blocks** are an option, **BUT Neuraxial Anesthesia** is often **unsuccessful** in the presence of severe spinal involvement.

Systemic Lupus Erythematosus (SLE)

- A systemic autoimmune disease that is predominantly caused by **vasculitis**, with variable course (flares & remission periods).
- More likely to affect **females** (**7-fold** higher), as well as East-Asian or African-American ethnic backgrounds
- The **Multi-Organ** disease → musculoskeletal, cardiovascular, Pul , renal, neurological, dermatological, hematological, GI manifestations.
- **Common constitutional symptoms** → are **Fever & Chronic Fatigue**.
- The fevers may be explained by disease activity itself, & frequent infections(disease-induced immune dysfunction & imm-suppress treatment).
- **Musculoskeletal findings** → are typically a **migratory Arthritis** of the **small joints** in the **Hands** and **Feet**.
- **Dermatologic conditions** → alopecia, photosensitivity, and a **typical “Butterfly Rash”** across the cheeks and nose.
- Vasospasm of the digits(**Raynaud phenomenon**) → atrophy of nails and finger nails, → **difficult** to obtain **pulse oximetry readings**.

Systemic Lupus Erythematosus (SLE)

- **Pulmonary Manifestations** → interstitial lung dis, pleural effusions, frequent respiratory infections, & Pulmonary HTN.
- **Cardiovascular involvement** → HTN , premature IHD, pericarditis, myocarditis, coronary artery vasculitis, CMP , aseptic endocarditis,
- **Neurologic disease** → cerebral vasculitis, stroke, CVD, cognitive dysfunction, seizures, peripheral neuropathy, headache, affective disorders.
- **Hematological Manifestations** → anemia, leukopenia, thrombocytopenia, antiphospholipid Ab → Individuals with these antibodies typically have a **prolonged aPTT**, **BUT** are predisposed to **Pulmonary Emboli, Stroke, & recurrent Venous/ Arterial Thromboses**.
- **Lupus Nephritis** is a common end-organ complication that carries a **poor prognosis** and often results in ESRD.

❑ The Preoperative Evaluation

should assess all major organ systems and relevant medications.

- **The history** **should** cover **details** on typical disease flairs(manifestations, timing, treatment), fevers, & major organ system symptoms
- **The pre-op Physical Examination** concentrates on the pulmonary (rales, ↓breath sounds), cardiac (pericardial rubs, murmurs, arrhythmias, jugular venous distention, peripheral edema), and nervous (motor deficits, sensory deficits, visual disturbances) systems.
- **Helpful Preoperative Tests → ECG , CBC, Electrolyte, Glucose, Creatinine concentrations, aPTT**

Significant ECG abnormalities (conduction delays, arrhythmias, Q waves, low voltage) **should** → Cardiology/Pulmonology **Consultation**.

- **Other Tests →**
 - **INR** (patients receiving warfarin),
 - **Echocardiogram** (murmurs, suspected heart failure, suspected effusion),
 - **CXR** (pulmonary symptoms /suspected heart failure),
 - **PFTs** (worsening / undiagnosed dyspnea).

❑ The Preoperative Evaluation

- **High Risk Patients** → advanced CMP , decompensated HF, PHTN , systemic vasculitis, recent/ recurrent thromboembolism → best managed in concert with the appropriate specialists.
- **Medications** → most of them **should be continued** [Corticosteroids , Hydroxychloroquine, Cyclosporine, Azathioprine, Tacrolimus]
- Some of them require **Temporary Discontinuation** → **Anticoagulant** (consultation with a hematologist) **Complex Biological Immunosuppressant** [(Belimumab) → collaboratively with their Rheumatologist]
- Patients on long-term corticosteroid therapy → perioperative **stress dose corticosteroids**.

Cancers & Tumors In Preoperative Patients

- Patients with cancer may have complications related to both the disease itself and its treatment (chemotherapy, radiation therapy).
- A **Hypercoagulable State** is also common in cancer, particularly advanced disease.
- The risk of thromboembolic events is increased **six-fold** in patients with cancer, with active cancer accounting for **20%** of new cases of thromboembolism.
- ◻ **The Preoperative Evaluation** focuses on cardiac, pulmonary, neurologic, and hematologic systems.
- Previous **head and neck irradiation** may cause carotid artery disease, hypothyroidism, or difficulty with airway management. → **Auscultation** for bruits, **Thyroid Function Tests**, **carotid Doppler** studies are therefore recommended.
- younger patients with a history of radiation therapy should be assessed for cardiac symptoms and undergo an **ECG** —even if they may not otherwise be at risk for heart disease. → ± **Echocardiography** may

- Previous irradiation to the lungs, breast, or mediastinum may also cause radiation pneumonitis. ➔ an oxygen saturation measurement and CXR ± PFTs if appropriate.
- **Other important chemotherapy-associated side effects** include
 - **CMP** with trastuzumab & anthracyclines (doxorubicin);
 - **Pulmonary toxicity** with bleomycin;
 - **Nephrotoxicity** with cisplatin;
 - **Hemorrhagic Cystitis** with cyclophosphamide;
 - **Peripheral Neuropathy** with vincristine OR Cisplatin.
- Patients who received corticosteroids as part of their cancer treatment may be at risk for adrenal insufficiency. ➔ supplemental perioperative corticosteroids

- Consequently, elective major surgery should be scheduled after temporary discontinuation of these agents, whenever feasible.
- The time interval for preoperative discontinuation varies across these agents from
 - 28 days (bevacizumab)
 - 1 week (sunitinib, sorafenib, pazopanib, vandetanib, cabozantinib)
 - 48 hours (axitinib).
- Based on the type of chemotherapy, an **ECG**, **CXR**, **CBC**, **Electrolyte**, **Creatinine**, & **Liver Function Tests** may be needed.
- In some cases, consideration may be given to delaying the surgical procedure to allow resolution of neutropenia and thrombocytopenia.
- In general, advance planning of blood component replacement (type and screening in the preoperative clinic) can avoid delays on the day of surgery.

Mediastinal Masses

- Tumors that may occur in the anterior mediastinal space include :
lymphomas, thymomas, teratomas, thyroid goiters, and metastatic tumors.
- Anterior mediastinal masses can obstruct the great vessels (aorta, pulmonary arteries, pulmonary vein, superior vena cava), heart, trachea, and bronchi.
- Patients may complain of dyspnea, dysphagia, stridor, wheezing, coughing (especially when recumbent), and orthopnea.
- Compression of the SVC ➔ **Superior Vena Cava Syndrome**, which is characterized by
 - Jugular Venous distention
 - Edema in the face, neck, chest, and upper extremities.
 - may also ↑ ICP and airway compromise.

Mediastinal Masses

- **Imaging of the chest** (with **CT** or **MRI**) and **Echocardiography** are needed if airway, cardiac, or vascular compression is suspected.
- **Flow-volume loops** may also be useful to assess the **location** (extrathoracic vs. intrathoracic) and degree of airway obstruction.
- **Patients with tracheobronchial, cardiac, or major vessel compression** require special anesthetic precautions, including possible **awake fiberoptic intubation**.

Carcinoid Tumors

- Carcinoid tumors are **rare neuroendocrine tumors** that release mediators. They are associated with **MEN type 1**.
- These tumors typically occur in the GI tract and are the most common neoplasms of the appendix; they can also occur in the pancreas and bronchi.
- Carcinoid syndrome is caused by **vasoactive amines** (serotonin, norepinephrine, histamine, dopamine), **polypeptides** (bradykinin, somatostatin, vasoactive intestinal peptide, glucagon), **prostaglandins** released by the tumors.
- Typical manifestations include **flushing, Tachycardia, Arrhythmias, Diarrhea, Malnutrition, Bronchospasm, Carcinoid Heart disease**.
- most patients are asymptomatic because the liver inactivates the bioactive products of carcinoid tumors.
- patients with GI carcinoid tumors have manifestations of carcinoid syndrome **only if they have hepatic metastases**.

Carcinoid Tumors

- **Carcinoid Heart Disease** is characterized by **endocardial fibrosis** Of **Pulmonic & Tricuspid Valves**. → Affected individuals may then develop **Tricuspid Regurgitation, Pulmonic Stenosis, Pulmonic Regurgitation**, Right-sided Heart Failure, peripheral edema, and hepatomegaly.
- They may also develop **carcinoid crisis**, which is associated with **profound flushing, bronchospasm, tachycardia**, and **hemodynamic instability**.
- These life-threatening episodes can occur with induction of anesthesia, intraoperative handling of a tumor, or other invasive procedure on a tumor (e.g., tumor embolization).
- **Electrolyte, Creatinine, Albumin** concentrations (Malnourished patients), **ECG** & **Echocardiogram**
- The mainstay of pharmacologic treatment of carcinoid syndrome are somatostatin analogues, namely **octreotide** and **lanreotide**.
- An alternative approach for high-risk major procedures → start a continuous IV infusion 50 µg /hour of octreotide 12 hours before surgery and continue it for at least 24 to 48 hours after surgery

Special Issues in Preoperative Evaluation

BREASTFEEDING PATIENTS

- There are limited data to help guide recommendations for the safety of anesthetics and medications in babies of breastfeeding mothers who receive these agents.
- For elective surgery, women should be advised to pump and store milk preoperatively; this milk can be used in the first 24 after anesthesia administration,
- The mother **should** discard milk produced within **the first 24 hours** after anesthesia, and then generally resume breastfeeding after this period.
- Very young or premature babies, especially those susceptible to apnea, may be at risk if the mothers continue to take opioid or sedating drugs.

MORBIDLY OBESE PATIENTS

- The morbidly obese patient presents special preoperative risks.
- Obesity is associated with several important co-morbidities, including:
- DM , HTN , CVD, cancer, OSA (Obstructive Sleep Apnea), and poor functional capacity.
- ↑risk for NASH, which can result in abnormal LFT, liver fibrosis, end-stage liver disease.
- ↑risk for right-sided heart failure and pulmonary hypertension.
- obesity-hypoventilation syndrome (**OHS**), also known as **Pickwickian syndrome**.
 - **OHS** is characterized by **impaired central ventilatory drive** and is distinct from OSA.
 - It is associated with **awake, chronic hypoxemia** ($\text{PaO}_2 < 65 \text{ mm Hg}$) without a diagnosis of COPD or primary lung disease.
- higher rates of difficult bag-mask ventilation and difficult tracheal intubation

MORBIDLY OBESE PATIENTS

- **The Preoperative Evaluation** focuses on relevant co-existing diseases, airway, cardiopulmonary system, and vital signs (including pulse oximetry).
- When measuring blood pressure, the cuff should have a width that is approximately two thirds of the arm and a length that can adequately encircle the extremity.
- **Assessment of neck circumference** → identify risk for difficult intubation.
- Determine both actual body weight and ideal body weight (**IBW**) → helpful in dose selection for certain medications (NMBs) & determining optimal intraoperative mechanical ventilation settings.
- Two previously available antiobesity medications, **fenfluramine** and **dexfenfluramine** (were withdrawn from the market in 1997), → significant cardiac side effects, Regurgitant Valvular lesions & PHTN.
- **Any individual who was ever exposed to these drugs should undergo a cardiovascular evaluation, including an Echocardiogram.**

PATIENTS WITH TRANSPLANTED ORGANS

- The number of patients with transplanted organs who require non transplant surgical procedures increases yearly.
- Close interaction with the transplant team is one of the most important steps in the perioperative care of these patients.
- Clinicians performing the preoperative assessment should ensure that the transplant care providers are made aware of the upcoming procedure and are given an opportunity to make recommendations.
- In all transplant recipients, the level of function of the transplanted organ and the presence of any rejection should be evaluated.
- The dosage regimen of all immunosuppressant medications should be noted, and patients should be instructed to continue these medications perioperatively.

PATIENTS WITH TRANSPLANTED ORGANS

- Patients should be assessed for complications related to immunosuppressant therapy.
- These complications include the following:
 - Hyperglycemia and Adrenal Suppression (corticosteroids);
 - Increased Risks Of Infection, HTN , Renal Insufficiency(corticosteroids, cyclosporine, tacrolimus);
 - Myelosuppression causing anemia, thrombocytopenia, leukopenia (azathioprine, sirolimus).

- Although transplant recipients are at increased risk for postoperative infections, no evidence indicates that higher doses of antibiotic prophylaxis provide added benefit. Instead, usual preoperative recommendations for antibiotic prophylaxis should be followed.
- Stress-associated adrenal insufficiency may occur in patients taking long-term corticosteroid therapy.
- Cardiac evaluation is important in all transplant recipients because they are at increased risk for cardiovascular disease.
- Preoperative Renal Function **should** also be assessed because long-term immunosuppressive regimens often lead to CKD.
- **Thromboprophylaxis** **should** be considered in all transplant recipients.

- **Kidney transplant recipients** present some specific issues for preoperative evaluation.
- Despite the presence of a normal creatinine concentration, GFR in these individuals is generally decreased. ➔ predisposes these patients to **Electrolyte** abnormalities and altered drug metabolism.
- Nephrotoxic drugs, such as NSAIDs & COX-2 inhibitors, should be avoided in all renal transplant recipients. In addition,
- the risk for CVD is increased to approximately twice that of the general population. ➔ Careful preoperative cardiovascular evaluation is essential.

- Successful **Liver Transplantation** usually resolves the hepatic and other end-organ effects of end-stage liver disease.
- Nonetheless, some pretransplant pulmonary problems may not resolve after transplantation, thus necessitating careful evaluation of pulmonary function.
- These disturbances can include **hepatopulmonary syndrome**, which involves hypoxemia from intrapulmonary vascular shunting.
- Other patients may continue to demonstrate **ventilation-perfusion mismatch** related to pulmonary effusions, ascites, or diaphragmatic dysfunction, as well as diffusion abnormalities resulting from interstitial pneumonitis or impaired hypoxic pulmonary vasoconstriction.
- Following successful **Lung Transplantation**, recipients may require months to achieve peak pulmonary function.
- Compared with all other allografts, the transplanted lung is especially **susceptible to infection and rejection** as a result of its exposure to the external environment.
- Careful pre-operative evaluation with PFTs should be considered in all lung transplant recipients, with postponement of elective surgery when allograft rejection or infection is suspected

- Other perioperative considerations include airway hyper responsiveness, loss of the cough reflex, and potential for injury to the airway anastomosis with intubation.
- These patients are also at increased risk for pulmonary edema, which has been attributed to disrupted lymphatic drainage in the transplanted lung.
- Most issues relating to **Heart Transplant** recipients relate to the absence of autonomic innervation in the transplanted heart.
- This denervation has multiple physiologic effects, such as
 - a **higher than normal resting heart rate** (from absence of vagal tone);
 - the **absence of cardiac baroreflexes**; and
 - the **lack of response to carotid sinus massage, Valsalva maneuver, laryngoscopy, Tracheal Intubation.**
- The allograft demonstrates
 - a normal or augmented response to **direct-acting drugs** (e.g., **Epinephrine**),
 - a blunted response to **indirect-acting agents** (e.g., **Ephedrine**), and
 - **No Response** to **vagolytic agents**.

- **Chronic allograft rejection** can manifest as accelerated IHD, and ventricular dysfunction (both systolic and diastolic).
- Because allograft denervation causes any myocardial ischemia to be silent, typical clinical manifestations include fatigue, ventricular dysrhythmias, heart failure, and ECG evidence of a silent myocardial infarction.
- Heart transplant recipients undergo routine periodic evaluation for IHD (cardiac stress testing or coronary angiography) and ventricular function(echocardiogram).
- **The ECGs of these patients** may reveal conduction abnormalities, and **two P waves** (a small nonconducted P wave from the native atria and a normal-sized conducted P wave from the donor atria).
- Many heart transplant recipients also require permanent pacemakers, and pacemaker function should be confirmed during the preoperative evaluation.

A close-up photograph of numerous green, circular buttons, each featuring a simple black smiley face. One button in the center is a contrasting bright yellow color. The buttons are arranged in a dense, overlapping cluster.

از توجه شما سپاسگزارم