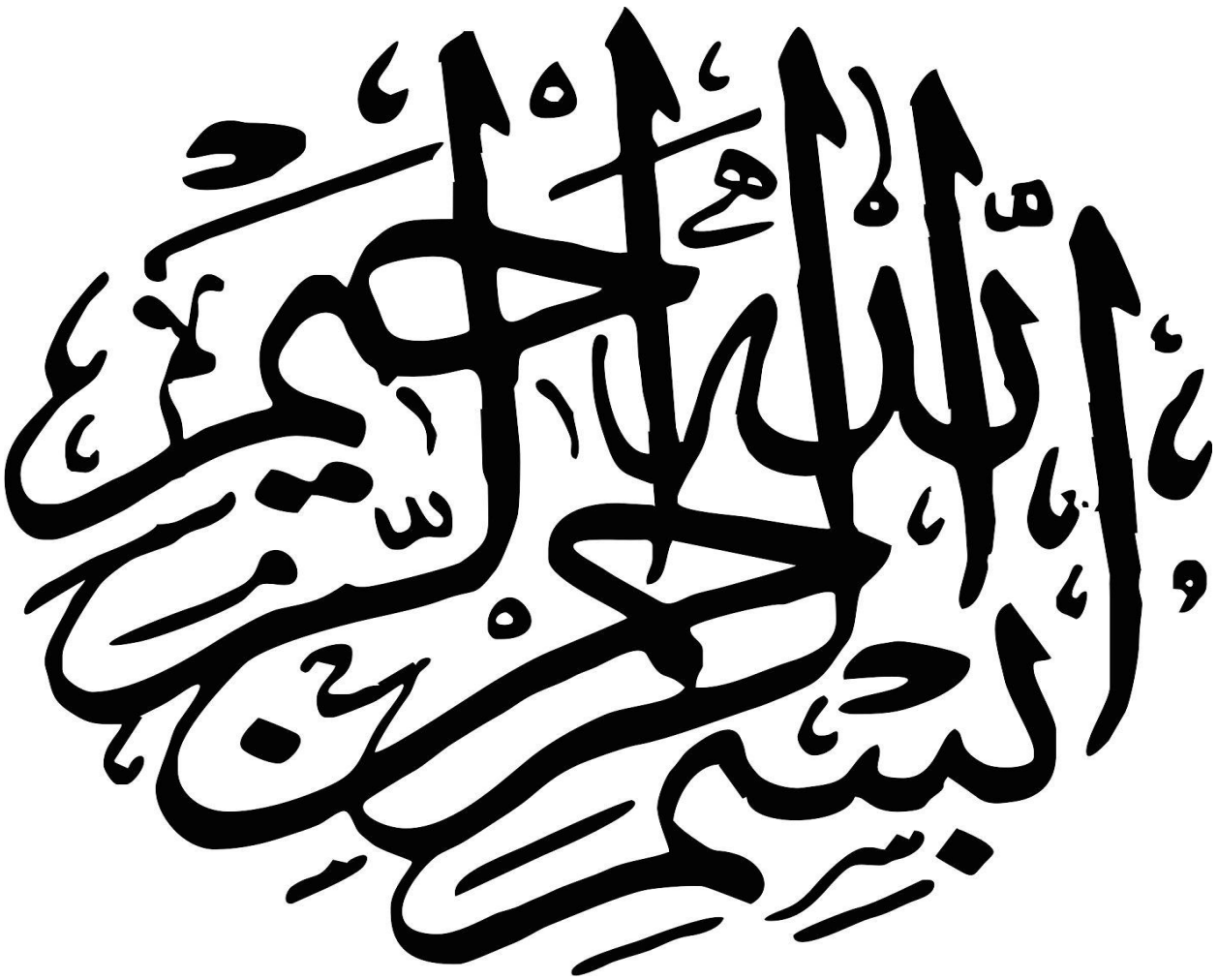
بسم الله الرحمن الرحيم

Preoperative Evaluation

- **ENDOCRINE DISORDERS**

- **Diabetes Mellitus :** Two main disease categories are type 1 diabetes (previously called “insulin-dependent diabetes” or “juvenile-onset diabetes”) and type 2 diabetes (previously called “non–insulin dependent diabetes” or “adult-onset diabetes”)

- Type 1 diabetes,have an absolute deficiency of insulin, but normal sensitivity to insulin

- Adults with type 1 diabetes are at risk of premature vascular disease, such as IHD, nephropathy, retinopathy, and peripheral neuropathy;and also at risk of diabetic ketoacidosis

- Type 2 diabetes is characterized by insulin resistance and a relative (but not absolute) deficiency in insulin

- Most affected individuals are obese and seldom prone to ketoacidosis

- Diabetes mellitus is associated with multi organ dysfunction, including IHD, heart failure (independent of associated IHD), CVD, CKD, peripheral neuropathy, autonomic neuropathy (e.g., postural hypotension, gastroparesis), retinopathy, and reduced joint mobility (e.g., reduced cervical mobility affecting airway management)

- In the perioperative setting, DM is a risk factor for postoperative complications, including cardiac events,acute kidney injury (AKI),and surgical site infections

- During the preoperative evaluation of a patient with DM, the anesthesiologist should document the disease type (i.e., type 1 vs. type 2), current usual glycemic control, history of hypoglycemic episodes, current therapy, and the severity of any end-organ complications

- Physical examination should especially focus on the cardiovascular, renal, and neurologic systems

- Inquiries about postural dizziness, early satiety, and postprandial vomiting can help assess for any autonomic neuropathy

- physical examination should include an evaluation of pulses, skin breakdown, and joint (especially cervical spine) mobility

- Preoperative laboratory tests include an ECG and blood sampling for electrolyte, creatinine, blood glucose concentration,and calculated GFR

- diary of multiple glucose values (preprandial and postprandial) at varying times of the day is more informative for estimating the adequacy of therapy; Alternatively, HbA1c can help characterize the average plasma glucose concentration within the prior 3 months

- Among surgical patients, preoperative HbA1c is more informative than patients' self-reported history, fasting blood glucose concentrations, and random blood glucose concentrations in identifying preexisting poor glycemic control

- Target HbA1c concentration is under 7% for most diabetic patients

- Preoperative HbA1c is correlated with postoperative glycemic control,[2] its role as a predictor of postoperative complications is largely restricted to diabetic patients undergoing orthopedic or vascular surgery

- *In the perioperative setting, the goals of glycemic management are to avoid hypoglycemia, prevent ketoacidosis, and avoid marked hyperglycemia*

- All diabetic patients should have their surgery as an early morning case to minimize any disruption of their diabetic management fasting

- Normal treatment regimen for most non-insulin diabetic medications (metformin, sulfonylureas, repaglinide, GLP-1 agonists, DPP-4 inhibitors) should be continued until the day before surgery but held on the morning of surgery

- Possible exception pertains to SGLT2 inhibitors(empagliflozin), which have been associated with euglycemic diabetic ketoacidosis in the postoperative setting

- Diabetic patients should discontinue *short-acting* insulin while fasting

- Exception pertains to patients with continuous subcutaneous insulin infusion pumps

- These individuals should continue their infusion at the lowest basal rate, which is usually the night time fasting rate

- A reasonable approach is for patients with DM1 to take a small amount (one third to one half) of their usual morning dose of intermediate-acting or long-acting insulin (lente, isophane) to avoid diabetic ketoacidosis

- Patients with DM2 can either take no insulin or up to one half of their usual dose of intermediate-acting, long-acting, or combination insulin on the morning of surgery

- **Thyroid Disease:** Mild to moderate thyroid dysfunction probably has minimal perioperative impact

- Major concern pertains to significant hyperthyroidism or hypothyroidism, which appears to increase perioperative risk

- Preoperative evaluation should clarify the patient's current medical therapy as well as any recent changes

- In patients with known thyroid disease, additional preoperative thyroid function testing is not needed if the patient is on a stable medication dose and was assessed as being euthyroid within the previous 6 months

- IF additional preoperative testing is clinically indicated,TSH assays are best to evaluate for hypothyroidism, while free T3, free T4, and TSH levels are useful in hyperthyroid patients

- Surgery, stress, or illness can precipitate myxedema or thyroid storm in patients with untreated or severe thyroid dysfunction

- In general, if a patient has moderate or worse hypothyroidism (elevated TSH, low free T4 with or without associated symptoms), elective surgery should be postponed until the individual is euthyroid

- Elective *non-thyroid* surgery should also be delayed to facilitate treatment of patients with overt hyperthyroidism (suppressed TSH with elevated free T4 or T3 with or without associated symptoms)

- Consultation with an endocrinologist is necessary if surgery is urgent in patients with thyroid dysfunction

- IF surgery is urgent, hyperthyroid patients can be treated with β-adrenergic blockers, antithyroid medications methimazole, PTU, potassium iodide), and corticosteroids

- Useful tests include CXR or CT scans to evaluate tracheal or mediastinal involvement by a goiter
- All thyroid replacement therapy and anti thyroid drugs should be continued on the day of surgery

- **Parathyroid Disease :** Parathyroid hormone regulates calcium

- Most cases of hyperparathyroidism are discovered based on an incidental elevated calcium level found during diagnostic testing

- It is very unlikely that parathyroid glands become sufficiently enlarged to compromise the airway

- **Hypothalamic-Pituitary-Adrenal Disorders :** ACTH, regulates cortisol release from the adrenal cortex

- Cortisol secretion varies with the circadian rhythm, with the highest release in the morning

- Cortisol release increases with physical stress, psychological stress, fever, and hypoglycemia

- Among physical stressors, surgery is one of the most potent activators of the hypothalamic-pituitary-adrenal axis

- Greatest ACTH secretion occurs during termination of anesthesia and the immediate postoperative period

- In procedures with minimal associated stress (inguinal hernia repair), increased cortisol secretion lasts for about 24 hours

- In more complicated procedures (major abdominal surgery), the response is larger in magnitude and lasts for about 5 days after surgery

- Major manifestations of Cushing syndrome are obesity (with characteristic patterns of fat deposition causing “moon facies” and a “buffalo hump”), diabetes mellitus, female virilization, OSA, HTN, elevated cardiovascular risk, elevated VTE risk, osteoporosis, striae, skin atrophy, and easy bruising

- Airway management can be challenging in affected patients due to obesity and OSA

- Peripheral intravenous access can be difficult because of skin atrophy and obesity

- These patients may require an ECG and blood sampling for electrolytes and glucose

- Despite easy bruising, they have normal coagulation profiles

- Perioperative corticosteroid supplementation is not required for individuals who have received less than 5 mg prednisone (or its equivalent) daily,or less than 3 weeks of corticosteroids (regardless of dose)

- Patients taking prednisone (or its equivalent) in daily doses exceeding 20 mg/day for more than 3 weeks, and patients with Cushing syndrome should have perioperative corticosteroid supplementation

- Need for supplementation is unclear for patients who have taken prednisone (or its equivalent) at a daily dose of 5 to 20 mg for more than 3 weeks

- Adrenal insufficiency results from destruction of the pituitary gland, destruction of the adrenal glands (e.g., autoimmune disease, tuberculosis, HIV infection), or long-term exogenous glucocorticoid administration (most common cause)

TABLE 31.15 Recommendations for Perioperative Corticosteroid Coverage

Surgical Stress	Target Hydrocortisone Equivalent	Preoperative Corticosteroid Dose	Perioperative Corticosteroid Dose
Superficial procedure (e.g., biopsy, dental procedure)	8–10 mg/day	Usual daily dose	▪ Then usual daily dose
Minor (e.g., inguinal hernia repair, colonoscopy, hand surgery)	50 mg/day	Usual daily dose	▪ Hydrocortisone 50 mg IV before incision ▪ Hydrocortisone 25 mg IV every 8 h for 24 h ▪ Then usual daily dose
Moderate (e.g., colon resection, total joint replacement, lower extremity revascularization)	75–150 mg/day	Usual daily dose	▪ Hydrocortisone 50 mg IV before incision ▪ Hydrocortisone 25 mg IV every 8 h for 24 h ▪ Then usual daily dose
Major (e.g., esophagectomy, pancreatoduodenectomy, major cardiac, major vascular, trauma)	75–150 mg/day	Usual daily dose	▪ Hydrocortisone 100 mg IV before incision ▪ Continuous IV infusion of 200 mg of hydrocortisone over 24 h ▪ Then usual daily dose OR ▪ Hydrocortisone 50 mg IV every 8 h for 24 h ▪ Taper dose by 50% per day until usual daily dose is reached* ▪ Then usual daily dose

*Administer continuous IV fluids with 5% dextrose and 0.2% to 0.45% sodium chloride (based on degree of hypoglycemia).

- Consultation with an endocrinologist is required if formal diagnostic testing for adrenal insufficiency is required, and to facilitate treatment of patients meeting the diagnostic criteria

- Patients should continue their replacement corticosteroid therapy on the day of surgery and may need further supplementation based on the expected surgical stress response

- **Multiple Endocrine Neoplasia Syndromes :**There are three types MEN syndrome; MEN type 1, MEN type 2A, and MEN type 2B

- Recognition is important to facilitate treatment of the affected patient and evaluation of family members

- MEN type 1 is characterized by the “3 Ps,” namely tumors of the parathyroid glands, anterior pituitary, and pancreatic islet cells

- Hyperparathyroidism is the most common manifestation of MEN type 1

- pheochromocytoma is present in about 50% of MEN type 2

- IF a pheochromocytoma is present, it should be removed before any other tumor resections

- **Pheochromocytoma**
  Pheochromocytomas are catecholamine-secreting tumors that arise from chromaffin cells of the adrenal medulla

- A diagnosis of pheochromocytoma should be considered if any of the following features is present:
- Triad of episodic headaches, sweating, and tachycardia

- Hyper adrenergic spells (e.g., non exertional palpitations, diaphoresis, headache, tremor)
- Hypertension that is difficult to control, or occurs at a young age
- Hypertension associated with new-onset or atypical diabetes mellitus
- Idiopathic dilated cardiomyopathy

- Family history of pheochromocytoma or suspicious familial syndrome (von Hippel-Lindau syndrome, MEN type 2, neurofibromatosis type 1)

- A history of gastric stromal tumors or pulmonary chondromas

- Incidentally discovered adrenal mass

- Patients scheduled for pheochromocytoma resection should undergo surgery at centers with experienced teams of anesthesiologists and surgeons

- They also require about 10 to 14 days of medical preparation before surgery to mitigate perioperative risks;goals of this preparation are to control hypertension, control tachycardia, and normalization of intravascular volume status

- Mainstay of medical therapy is preoperative α-adrenergic blockade started 7 to 14 days before surgery

- preferred drug at many centers is phenoxybenzamine

- Arterial blood pressure target is less than 130/80 mm Hg in the seated position, with systolic pressure less than 90 mm Hg while standing

- Some centers instead use selective α_1-adrenergic blocking drugs (prazosin, terazosin, doxazosin)

- These agents are also preferable when long-term pharmacologic treatment is indicated (metastatic pheochromocytoma)

- Disadvantage of selective α_1-adrenergic blocking drugs is their incomplete degree of α-adrenergic blockade, thus resulting in more episodes of intraoperative hypertension

- After adequate α-adrenergic blockade, β-adrenergic blockade may be started cautiously with short-acting drugs

- After 24 to 48 hours, a long-acting preparation (metoprolol, atenolol) can be substituted, provided that the patient tolerates β-adrenergic blockade

- Dose is then adjusted to achieve a heart rate between 60 and 80 beats/ min

- β-Adrenergic blockade should *never* be initiated before α-adrenergic blockade

- Alternatives to perioperative α-adrenergic blockade include calcium channel blockers and metyrosine

- Nicardipine is the most commonly used calcium channel blocker for this indication

- Monotherapy with calcium channel blockers is not recommended

- Preoperative evaluation of a patient with known pheo should focus on the cardiovascular system (including orthostatic vital signs) and current medical treatment (including adequacy of treatment)

- Laboratory testing includes an ECG, CBC, Cr, BS, and electrolyte concentrations

- Patient may also warrant echocardiography or a cardiology consultation