

Thyroid Disorders (Functional)

TFT INTERPRETATION • GRAVES • HASHIMOTO • EMERGENCIES

KMU - FINAL YEAR MEDICINE

1. INTERPRETING TFTS (THE MATRIX)

Condition	TSH	Free T4	Notes
Primary Hyper	LOW	HIGH	Graves, Toxic Adenoma.
Primary Hypo	HIGH	LOW	Hashimoto's.
Subclinical Hyper	LOW	Normal	Risk: AFib, Osteoporosis. Treat if TSH < 0.1.
Subclinical Hypo	HIGH	Normal	Treat if TSH > 10 or Symptomatic/Pregnant.
Secondary (Pituitary)	Low/Normal	LOW	"Central Hypothyroidism". MRI Pituitary.

2. HYPERTHYROIDISM (THYROTOXICOSIS)

Causes:

- Graves' Disease (75%):** TSH Receptor Antibodies (TRAb) stimulate gland.
- Toxic Multinodular Goiter (TMNG):** Elderly. No eye signs.
- Thyroiditis:** Transient release of stored hormone.

Graves' Specific Signs:

- Thyroid Eye Disease (Exophthalmos, Lid Lag).
- Pretibial Myxedema (Non-pitting edema).
- Thyroid Acropachy (Clubbing).
- Diffuse Goiter with **Bruit**.

Investigation (The Diff Dx Tool):

Radioactive Iodine Uptake (RAIU) Scan:

- HIGH Uptake (Diffuse):** Graves.
- HIGH Uptake (Focal):** Toxic Adenoma ("Hot Nodule").
- LOW/Absent Uptake:** Thyroiditis (De Quervain's/Silent) or Exogenous Thyroxine.

3. MANAGEMENT OF HYPERTHYROIDISM

Symptomatic: Beta-Blockers (Propranolol) for tremors/palpitations.

Anti-Thyroid Drugs (ATD):

- Carbimazole:** 1st line. Risk: **Agranulocytosis** (Sore throat = Stop & Check CBC).
- PTU (Propylthiouracil):** Use in **1st Trimester Pregnancy** or **Thyroid Storm**. (Hepatotoxic).

Radioactive Iodine (I-131):

- Cure for Graves/TMNG.
- CI: Pregnancy, Active Eye Disease (Worsens ophthalmopathy).

Surgery: For large goiter or malignancy suspicion.

4. HYPOTHYROIDISM

Most Common Cause: Hashimoto's Thyroiditis.

- Antibodies:** Anti-TPO (Thyroid Peroxidase) & Anti-Thyroglobulin.
- Features:** Cold intolerance, Weight gain, Bradycardia, Delayed DTR relaxation.

Management:

- Levothyroxine (T4):** Start 50-100mcg daily.
- Empty Stomach:** 30 mins before breakfast.
- Elderly/Ischemic Heart:** Start LOW (25mcg) to prevent Angina.

5. SPECIAL SCENARIOS (EXAM TRAPS)

Sick Euthyroid Syndrome:

- Occurs in severe illness (ICU patients).
- Labs: **Low T3**, Normal/Low T4, Normal/Low TSH.
- Rx: Do NOT treat. Recheck after recovery.

Amiodarone Effect:

- Contains Iodine (Structurally looks like T4).
- Type 1:** Iodine induced Hyperthyroidism (Jod-Basedow).
- Type 2:** Destructive Thyroiditis.
- Hypothyroidism:** Wolff-Chaikoff effect (shuts down gland).

De Quervain's (Subacute) Thyroiditis:

- PAINFUL** Goiter following viral illness.
- High ESR.
- Phases: Hyper -> Hypo -> Euthyroid.

6. ENDOCRINE EMERGENCIES

🚨 THYROID STORM (CRISIS)

Precipitant: Infection, Surgery, Trauma in uncontrolled Graves.
Signs: Fever (>38.5), Tachycardia (>140), Agitation, Vomiting.

Treatment (4 Ps):

- Propylthiouracil** (Blocks synthesis + T4->T3 conversion).
- Propranolol** (Control HR).
- Prednisolone** (Hydrocortisone - blocks conversion).
- Potassium Iodide** (Lugol's) - Give 1 hour AFTER PTU to block release.

🚨 MYXEDEMA COMA

Features: Hypothermia, Bradycardia, Altered Mental Status.
Treatment: IV Levothyroxine + IV Hydrocortisone (Always cover for Adrenal Insufficiency) + Passive Warming.

Thyroid Neoplasia & Nodules

NODULE WORKUP • CANCER TYPES • SURGERY RISKS

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7. APPROACH TO THYROID NODULE

Step 1: TSH Level

- **If LOW:** Do Radionuclide Scan. (Hot = Adenoma, Cold = Cancer risk).
- **If NORMAL/HIGH:** Do Ultrasound.

Step 2: Ultrasound Features (Malignancy Risk):

- Hypoechoic (Dark).
- Irregular margins.
- Microcalcifications.
- Taller than wide shape.

Step 3: FNA (Fine Needle Aspiration):

- Indicated if nodule >1cm with suspicious features.
- **Bethesda System** used for reporting.

8. THYROID CANCERS OVERVIEW

Type	Frequency	Prognosis
Papillary	80% (Most Common)	Excellent
Follicular	10 - 15%	Good
Medullary	5%	Variable (MEN2)
Anaplastic	< 2%	Very Poor (Deadly)

9. PAPILLARY CARCINOMA

"P" Features:

- **P**opular (Most common).
- **P**sammoma Bodies (Calcifications).
- **P**alpable Lymph Nodes (Lymphatic spread).
- **P**ositive Prognosis.
- **P**rior Radiation exposure is a risk factor.

Histology: "Orphan Annie" eyes (Empty nuclei).

Rx: Total Thyroidectomy + Radioiodine ablation.

10. FOLLICULAR CARCINOMA

The FNA Trap:

- FNA **CANNOT** distinguish between Follicular **Adenoma** (Benign) and **Carcinoma**.
- Why? Diagnosis requires evidence of **Capsular or Vascular Invasion** (Histology needed).
- **Management:** Diagnostic Hemithyroidectomy first. If cancer -> Completion Thyroidectomy.
- **Spread:** Hematogenous (Blood) -> Bones/Lungs. (Unlike Papillary which goes to Nodes).

11. MEDULLARY CARCINOMA

- **Origin:** Parafollicular **C-Cells**.
- **Marker: Calcitonin** (Tumor marker).
- **Pathology:** Amyloid stroma (Apple-green birefringence).
- **Associations:** MEN 2A and MEN 2B syndromes.
 - *Always check for Pheochromocytoma before surgery!*
- **Rx:** Surgery only (Radioiodine doesn't work).

12. ANAPLASTIC CARCINOMA

Patient: Elderly presenting with rapidly growing mass.
Symptoms: Hoarseness (RLN palsy), Dysphagia, Stridor.
Prognosis: Fatal within months.
Rx: Palliative (Tracheostomy for airway).

13. COMPLICATIONS OF SURGERY

1. Recurrent Laryngeal Nerve Injury:

- Unilateral -> Hoarseness.
- Bilateral -> Airway obstruction (Emergency).

2. Hypocalcemia (Parathyroid damage):

- Tingling, Tetany, Chvostek/Trousseau signs.
- Rx: IV Calcium Gluconate.

3. Thyroid Storm: If patient wasn't euthyroid before surgery.

Parathyroid & Calcium

HYPERCALCEMIA • HYPOPARATHYROIDISM • EMERGENCIES

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1. HYPERPARATHYROIDISM (THE TYPES)

Type	Mechanism	Calcium	PTH
Primary	Adenoma (80%) Autonomous PTH secretion.	HIGH	HIGH
Secondary	CKD / Vit D Deficiency Response to Low Calcium.	LOW / Norm	HIGH
Tertiary	Longstanding CKD. Glands become autonomous.	HIGH	VERY HIGH

2. PRIMARY HYPERPARATHYROIDISM (PHPT)

"Stones, Bones, Groans & Psychiatric Overtones"

- **Stones:** Renal Calculi (Calcium Oxalate). Polyuria.
- **Bones:** Pain, Osteitis Fibrosa Cystica ("Brown Tumors"). Salt & Pepper skull.
- **Groans:** Constipation, Pancreatitis, Peptic Ulcer.
- **Psych:** Depression, Confusion.

Diagnosis:

1. **Serum Ca:** High.
2. **Serum PTH:** High (or inappropriately normal).
3. **Urinary Ca:** High (Differentiates from FHH).
4. **Sestamibi Scan:** Localizes the adenoma.

Treatment:

- **Surgery:** Parathyroidectomy (Curative).
- **Medical:** Cinacalcet (Calcimimetic) if unfit for surgery.

3. HYPERCALCEMIA OF MALIGNANCY

Mechanism: Tumor secretes **PTHrP** (PTH-related Peptide).

- Squamous cell Ca Lung, Breast Ca, Myeloma.

Labs:

- Calcium: **HIGH** (Often > 14 mg/dL).
- PTH: **SUPPRESSED (Low)**.

4. HYPERCALCEMIC CRISIS

🚨 ACUTE MANAGEMENT

Definition: Ca > 14 mg/dL + Confusion/Coma.
ECG: Short QT Interval.

Steps:

1. **Aggressive Fluids:** IV Normal Saline (3-4 Liters) to dilute & excrete Ca.
2. **Bisphosphonates:** Zoledronic Acid IV (Takes 2-3 days to work).
3. **Calcitonin:** Rapid onset (but tachyphylaxis occurs).
4. **Steroids:** Only if Granulomatous (Sarcoid) or Myeloma.

5. HYPOPARATHYROIDISM

Causes:

- **Post-Surgical (Most Common):** After Thyroidectomy.
- **Autoimmune:** DiGeorge Syndrome.

Labs: Low Calcium, High Phosphate, Low PTH.

Pseudohypoparathyroidism (Albright's):

- End-organ resistance to PTH.
- **Labs:** Low Ca, **HIGH PTH**.
- **Signs:** Short 4th/5th metacarpal, Round face, Short stature.

6. HYPOCALCEMIA SIGNS

Symptoms: Perioral paresthesia, Tetany, Cramps.

Signs (Physical Exam):

- **Chvostek's Sign:** Tap facial nerve -> Lip twitch.
- **Trousseau's Sign:** Inflate BP cuff -> Carpopedal spasm (Wrist flexion).

ECG: Prolonged QT Interval (Risk of Torsades).

7. TREATMENT OF HYPOCALCEMIA

Acute (Tetany):

- **IV Calcium Gluconate:** 10ml of 10% solution over 10 mins.
- (Calcium Chloride is stronger but irritates veins).

Chronic:

- Oral Calcium + **Vitamin D (Calcitriol)**.
- *Note: Must use Calcitriol (Active D3) because PTH is needed to activate regular Vit D.*

Cushing's Syndrome

EXCESS CORTISOL • DIAGNOSTIC ALGORITHM • LOCALIZATION

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1. CLINICAL FEATURES

Most Common Cause: Exogenous Steroids (Iatrogenic).

Key Signs (Discriminating):

- Proximal Myopathy (Can't climb stairs/comb hair).
- Easy Bruising / Thin Skin.
- Violaceous Striae (Purple, >1cm wide).
- **Less specific:** Moon face, Buffalo hump, Central obesity (Lemon on sticks).

2. CLASSIFICATION (THE "ACTH" RULE)

ACTH Independent (Low ACTH):

- Adrenal Adenoma / Carcinoma.
- Exogenous Steroids (Adrenals atrophy).

ACTH Dependent (High ACTH):

- **Cushing's Disease:** Pituitary Adenoma (60%).
- **Ectopic ACTH:** Small Cell Lung Cancer (10%).

3. SCREENING TESTS

1. Overnight Dexamethasone Suppression Test (ONDST):

- Give 1mg Dex at 11pm. Measure Cortisol at 9am.
- **Normal:** Cortisol suppressed (< 50 nmol/L).
- **Cushing's:** Failure to suppress.

2. 24-Hour Urine Free Cortisol:

- Elevated in Cushing's.

False Positives (Pseudo-Cushing's):

- Alcoholism, Severe Depression, Obesity.

4. THE LOCALIZATION ALGORITHM

STEP 1: Check ACTH Level

- **Suppressed (Low): Adrenal Cause. (CT Adrenals).**
- **Elevated (High): ACTH Dependent. (Go to Step 2).**

STEP 2: High Dose Dex Suppression Test (HDDST)

- **Give 8mg Dexamethasone.**
- **Cortisol Suppresses (>50%): Pituitary (Cushing's Disease). It retains some feedback loop.**
- **No Suppression: Ectopic ACTH (Lung Cancer). Tumor is autonomous.**

STEP 3: CRH Stimulation Test (Tie-Breaker)

- **Pituitary: ACTH rises exaggeratedly.**
- **Ectopic: No response.**

5. ECTOPIC ACTH SYNDROME

Source: Small Cell Lung CA or Carcinoid Tumors.

Key Features:

- Very Rapid Onset.
- **Pigmentation:** Severe (ACTH stimulates melanocytes).
- **Hypokalemic Alkalosis:** (Cortisol acts like Aldosterone at high levels).

6. TREATMENT

Cushing's Disease: Trans-Sphenoidal Surgery (TSS).

Adrenal Adenoma: Adrenalectomy.

Medical (Pre-op): Metyrapone or Ketoconazole (Inhibit synthesis).

Nelson's Syndrome: Post-adrenalectomy -> Pituitary tumor grows rapidly (Pigmentation + Headache).

Addison's Disease

ADRENAL INSUFFICIENCY • CRISIS MGMT • SICK RULES

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7. ETIOLOGY & CLINICAL FEATURES

Definition: Destruction of Adrenal Cortex (>90%).

Causes:

- **Autoimmune (80%):** Developed world.
- **TB (Tuberculosis):** Developing world (Calcified adrenals on CT).
- **Metastasis:** Lung/Breast cancer.

Symptoms:

- "Lean, Tanned, Tired, Tearful".
- Postural Hypotension (Salt wasting).
- **Pigmentation:** Palmar creases, Buccal mucosa, Scars. (High ACTH).

8. ELECTROLYTE IMBALANCE

The Classic Triad:

1. **Hyponatremia** (Low Na).
2. **Hyperkalemia** (High K).
3. **Hypoglycemia** (Low Glucose).

Reason: Lack of Aldosterone (Mineralocorticoid) & Cortisol.

9. DIAGNOSIS

1. **Screening:** 9am Cortisol.
 - < 100 nmol/L = Likely Addison's.
 - > 450 nmol/L = Unlikely.

2. **Confirmatory: Short Synacthen Test (SST)**

- Give Synacthen (synthetic ACTH) IM.
- Measure Cortisol at 30 mins.
- **Normal:** Rises > 550 nmol/L.
- **Addison's:** No rise (Gland destroyed).

3. **Plasma ACTH:**

- **High:** Primary (Addison's).
- **Low:** Secondary (Pituitary failure - No pigmentation).

10. ADDISONIAN CRISIS (EMERGENCY)

🚨 **CODE RED PROTOCOL**

Triggers: Infection, Surgery, abrupt steroid withdrawal.
Presentation: Shock (BP < 80/50), Vomiting, Confusion.

IMMEDIATE ACTION:

1. **IV Hydrocortisone: 100mg Stat.**
2. **IV Fluids: 0.9% Saline (1 Litre stat) + Dextrose (if hypoglycemic).**
3. **Treat precipitating cause.**

****Do NOT wait for test results. Treat on suspicion!****

11. LONG TERM MANAGEMENT

Replacement Therapy (Lifelong):

1. **Glucocorticoid:** Hydrocortisone (15-25mg daily).
 - Dosed 2/3 in morning, 1/3 in evening (mimics diurnal rhythm).
2. **Mineralocorticoid:** Fludrocortisone (For BP/Sodium control).
 - *Note: Secondary insufficiency (Pituitary) does NOT need Fludrocortisone.*

12. SICK DAY RULES (PT EDUCATION)

Rule 1: Never Stop Steroids.

Rule 2: Minor Illness (Fever/Flu):

- **Double** the dose of Hydrocortisone.

Rule 3: Severe Illness (Vomiting/Trauma):

- Injectable Hydrocortisone (IM) immediately.
- Go to Hospital.

Rule 4: Wear a Medic-Alert bracelet.

Anterior Pituitary

ACROMEGALY • PROLACTINOMA • HYPOPITUITARISM

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1. ACROMEGALY (GH EXCESS)

Cause: Pituitary Macroadenoma (>1cm).

Clinical Features:

- **Appearance:** Spade-like hands, frontal bossing, macroglossia (large tongue), increasing shoe size.
- **Complications:** Diabetes, Colon Polyps (Cancer risk), Cardiomyopathy (Cause of Death).
- **Local Effect:** Bitemporal Hemianopia (Optic chiasm compression).

Diagnosis (The KMU Trap):

1. **Screening:** IGF-1 Level (High). **Random GH is useless (pulsatile).**
2. **Confirmatory:** OGTT (Oral Glucose Tolerance Test).
 - **Normal:** Glucose suppresses GH.
 - **Acromegaly:** Failure to suppress GH.
3. **Imaging:** MRI Pituitary.

Management:

- **1st Line:** Trans-Sphenoidal Surgery (TSS).
- **Medical:** Somatostatin Analogues (Octreotide/Lanreotide).
- **2nd Line Med:** Pegvisomant (GH receptor antagonist).

2. PROLACTINOMA

Most Common Functional Tumor.

Symptoms:

- **Women:** Galactorrhea, Amenorrhea, Infertility.
- **Men:** Erectile Dysfunction, Libido loss, Visual defects.

The "Prolactin Trap":

- **< 1000:** Likely Drug-induced (Metoclopramide, Haloperidol) or Stress.
- **> 5000:** Definite Prolactinoma.

🚨 TREATMENT EXCEPTION

Prolactinoma is the ONLY pituitary tumor where Medical Therapy is 1st Line.

Drug: Cabergoline (Dopamine Agonist) > Bromocriptine. It shrinks the tumor. Surgery only if drugs fail or vision threatened.

3. HYPOPITUITARISM

Causes:

- **Sheehan's Syndrome:** Post-partum necrosis due to PPH. First sign is failure to lactate.
- **Pituitary Apoplexy:** Hemorrhage into tumor. (Sudden headache, collapse).
- **Craniopharyngioma:** Most Common in Children (While non functioning adenoma in adults)

Hormone Replacement Order (Vital):

- **ALWAYS** replace **Cortisol FIRST.**
- Then Thyroxine (T4).
- *Reason: Giving T4 without Cortisol precipitates Adrenal Crisis.*

4. MEN SYNDROMES (QUICK REVIEW)

Syndrome	3 P's / 2 P's
MEN 1	Pituitary + Parathyroid + Pancreas.
MEN 2A	Parathyroid + Pheochromocytoma + Medullary Thyroid.
MEN 2B	Pheochromocytoma + Medullary Thyroid + Marfanoid/Mucosal neuromas.

Posterior Pituitary

DIABETES INSIPIDUS • SIADH • WATER DEPRIVATION TEST

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5. DIABETES INSIPIDUS (DI)

- Mechanism:** Problem with ADH (Anti-Diuretic Hormone).
- **Effect:** Cannot concentrate urine -> Polyuria (>3L/day) + Polydipsia.
 - **Labs:** High Serum Na, High Serum Osmolality, **LOW Urine Osmolality.**

Types:

1. Cranial (Central):

- **Deficiency** of ADH production.
- Causes: Head trauma, Tumor, Surgery.

2. Nephrogenic:

- **Resistance** to ADH in kidneys.
- Causes: **Lithium**, Hypercalcemia, Hypokalemia.

6. WATER DEPRIVATION TEST (SIMPLIFIED)

Step 1: Deprive Water

- If Urine Osmolality rises > 600 = Normal (Psychogenic Polydipsia).
- If Urine stays dilute (< 300) = Diabetes Insipidus.

Step 2: Give Desmopressin (Synthetic ADH)

- Urine Concentrates (> 50% increase):
→ Cranial DI (Body lacked ADH, you gave it, kidneys worked).
- No Change in Urine:
→ Nephrogenic DI (Kidneys are broken/resistant).

7. TREATMENT OF DI

Central DI: Desmopressin (DDAVP).

Nephrogenic DI: Thiazide Diuretics (Paradoxical effect) + NSAIDs. Stop Lithium.

8. SIADH (SYNDROME OF INAPPROPRIATE ADH)

- Definition:** Too much ADH -> Water Retention.
- Key Feature: Euvolemic Hyponatremia.** (Not edematous).
- Urine:** Concentrated (High Osmolality > 100).
- Blood:** Dilute (Low Sodium).

9. CAUSES OF SIADH

Mnemonic: "SIADH"

- **S**mall Cell Lung Cancer (Ectopic production).
- **I**nfection (Pneumonia/TB/Meningitis).
- **A**ntidepressants (SSRIs) / Anticonvulsants (Carbamazepine).
- **D**rugs (Sulfonylureas).
- **H**ead Injury.

10. MANAGEMENT OF SIADH

🚨 CORRECTION RULE

- 1st Line: Fluid Restriction (500-1000ml/day).
- 2nd Line: Demeclocycline (Blocks ADH).
- Severe (Coma/Seizure): Hypertonic Saline (3%).

DANGER: Correct Sodium SLOWLY.
Risk of Central Pontine Myelinolysis (Locked-in Syndrome) if corrected too fast.

11. KMU SCENARIO BANK

Q1: Patient on Lithium presents with polyuria.

Dx: Nephrogenic DI.

Rx: Stop Lithium.

Q2: Smoker with hyponatremia and normal BP.

Dx: SIADH (Likely Small Cell Lung Ca).

Q3: Post-TSS surgery, patient peeing 5L/day.

Dx: Cranial DI (Trauma to pituitary stalk).

Diabetes Mellitus

1. DIAGNOSTIC CRITERIA

Symptomatic Patient: One abnormal test.
Asymptomatic Patient: Two abnormal tests.

The Numbers (Memorize):

- **Fasting Glucose:** ≥ 7.0 mmol/L (126 mg/dL).
- **Random Glucose:** ≥ 11.1 mmol/L (200 mg/dL).
- **HbA1c:** $\geq 6.5\%$ (48 mmol/mol).
- **Prediabetes:** HbA1c 6.0 - 6.4%.

2. TYPES (BEYOND TYPE 1 & 2)

LADA (Latent Autoimmune Diabetes in Adults):

- "Type 1.5". Older patient, thin, GAD antibody (+).
- Often misdiagnosed as Type 2 but fails oral drugs rapidly.

MODY (Maturity Onset Diabetes of Young):

- Autosomal Dominant. < 25 years old.
- **MODY 3 (HNF-1a):** Sensitive to Sulfonylureas.

3. ORAL HYPOGLYCEMICS (THE TABLE OF TRUTH)

Class	Mechanism	Exam Pearl
Biguanides (Metformin)	Insulin Sensitizer	First Line. SE: GI upset. Stop if eGFR < 30. No Hypo risk.
SGLT-2 Inhibitors (-flozin)	Urine Glucose excretion	Best for Heart Failure / CKD. SE: UTI / Thrush.
GLP-1 Agonists (-glutide)	Incretin mimetic (Inj)	Best for Weight Loss. Cardioprotective.
Sulfonylureas (Gliclazide)	Squeeze Pancreas	Risk: Hypoglycemia & Weight Gain. Avoid in elderly/drivers.
DPP-4 Inhibitors (-gliptin)	Prolong GLP-1	Weight neutral. Safe in renal failure (Linagliptin).

4. ACUTE EMERGENCIES: DKA VS HHS

Feature	DKA (Type 1)	HHS (Type 2)
Onset	Rapid (Hours)	Slow (Days/Weeks)
Ketones	+++ (Acidosis)	Negative / Trace
Glucose	High (>11)	Very High (>30)
Osmolality	Normal	High (>320)
pH	Acidotic (<7.3)	> 7.3

5. DKA MANAGEMENT PROTOCOL

FIG-PICK

- F - Fluids:** 0.9% Saline (1L stat). Correct dehydration first.
- I - Insulin:** Fixed Rate IV Infusion (0.1 unit/kg/hr). *(Only start insulin AFTER fluids to prevent shock).*
- G - Glucose:** Add Dextrose when sugars drop < 14 mmol/L.
- P - Potassium:** Insulin drives K⁺ into cells.
 - If K < 3.5: Hold Insulin, replace K⁺.
 - If K 3.5-5.5: Add K⁺ to fluids.
- I - Infection:** Treat trigger.
- C - Chart:** Monitor ketones/pH.

6. HYPOGLYCEMIA (< 4.0 MMOL/L)

Symptoms: Sweating, Tremor, Palpitations (Autonomic) -> Confusion, Coma (Neuro).

Treatment:

- **Conscious:** 15-20g Fast acting carb (Juice/Gluco-gel).
- **Unconscious:** IV Dextrose (10% or 20%) OR IM Glucagon.

Diabetic Nephropathy

MICROALBUMINURIA • SCREENING • MANAGEMENT

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7. PATHOPHYSIOLOGY

Mechanism: Hyperglycemia → Hyperfiltration (High pressure in glomerulus) → Basement membrane thickening → Podocyte damage → Protein leak.

Histology (Pathognomonic): Kimmelstiel-Wilson Nodules (Nodular Glomerulosclerosis).

8. STAGES OF NEPHROPATHY

Stage 1: Hyperfiltration (GFR increases). Reversible.

Stage 2: Silent (Membrane thickening).

Stage 3: Microalbuminuria (ACR 3-30 mg/mmol). *Key Screening Stage*.

Stage 4: Overt Proteinuria (Dipstick Positive). GFR declines.

Stage 5: End Stage Renal Disease (ESRD).

9. SCREENING

Test: Urine ACR (Albumin:Creatinine Ratio).

• Do NOT use Dipstick for early screening (it only detects macroalbuminuria).

• **Diagnosis:** 2 abnormal ACR results over 3 months.

• **When:** Type 2 (At diagnosis). Type 1 (5 years after diagnosis).

10. MANAGEMENT OF NEPHROPATHY

1. BP Control (Crucial):

• **Target:** < 130/80 mmHg.

• **Drug of Choice: ACE Inhibitor (Ramipril) or ARB (Losartan).**
• **Mechanism:** Dilates Efferent arteriole → Reduces intraglomerular pressure.

• **Note:** Even if BP is normal, give ACEi if Microalbuminuria present.

2. SGLT-2 Inhibitors (Dapagliflozin):

• Reduces progression of CKD significantly.

• Add to regimen early.

3. Glycemic Control:

• **HbA1c Target:** ~7.0%.

11. EXAM TRAPS (KMU)

Contrast Nephropathy: Diabetics are high risk. Stop Metformin 48h before/after contrast.

Hyperkalemia: ACEi + Spironolactone + Diabetic Kidney = Dangerous K⁺ levels. Monitor carefully.

Insulin Clearance: As kidneys fail, insulin stays in blood longer. Patients might experience **hypoglycemia** and need LOWER insulin doses.

Obesity & Metabolic Syndrome

1. CLASSIFICATION (BMI)

Class	BMI (kg/m ²)	Asian Cut-off
Overweight	25.0 - 29.9	23.0 - 24.9
Obesity I	30.0 - 34.9	25.0 - 29.9
Obesity II	35.0 - 39.9	> 30.0
Morbid (III)	≥ 40.0	-

2. METABOLIC SYNDROME (IDF CRITERIA)

Central Obesity (Mandatory):
Waist > 94cm (Men) or > 80cm (Women) [South Asians]

- PLUS Any 2 of the following:**
1. Triglycerides: ≥ 1.7 mmol/L (150 mg/dL).
 2. HDL Cholesterol: < 1.0 (Men) or < 1.3 (Women).
 3. Blood Pressure: ≥ 130/85 mmHg.
 4. Fasting Glucose: ≥ 5.6 mmol/L (100 mg/dL).

3. SECONDARY CAUSES OF OBESITY

Endocrine:

- **Hypothyroidism:** (Modest gain, mostly fluid).
- **Cushing's Syndrome:** Central obesity, striae, muscle wasting.
- **PCOS:** Insulin resistance + Hyperandrogenism.
- **Insulinoma:** Gain due to over-eating to prevent hypoglycemia.

Genetic:

- **Prader-Willi Syndrome:** Hyperphagia, mental retardation, hypogonadism.
- **Leptin Deficiency:** Rare. Severe early onset.

4. PHARMACOTHERAPY

Indication: BMI > 30 (or > 27 with complications).

1. Orlistat:

- **Mechanism:** Lipase Inhibitor (blocks fat absorption).
- **Side Effect:** Steatorrhea (oily spotting), fecal urgency.

2. GLP-1 Agonists (Liraglutide / Semaglutide):

- **Mechanism:** Slows gastric emptying + Central satiety.
- **Side Effect:** Nausea, Pancreatitis risk.
- *Most effective medical option currently.*

5. BARIATRIC SURGERY

Indications (NICE Guidelines):

1. BMI ≥ 40.
2. BMI 35-40 with serious comorbidity (T2DM, Sleep Apnea).
3. Failed non-surgical measures for 6 months.

Types:

- **Sleeve Gastrectomy:** Removes 80% stomach (Restrictive).
- **Roux-en-Y Bypass:** Restrictive + Malabsorptive. Best for Diabetes remission.
- **Gastric Band:** Adjustable. High re-operation rate.

Complications:

- **Dumping Syndrome:** Hypoglycemia/diarrhea after sugar intake.
- **Nutritional:** B12, Iron, Calcium deficiency (Require lifelong supplements).

6. CLINICAL ASSOCIATIONS (HIGH YIELD)

NASH (Fatty Liver): ALT > AST. Obesity is #1 cause.

Sleep Apnea (OSA): Snoring + Daytime sleepiness + Neck circumference > 43cm.

Pseudotumor Cerebri: Obese female + Headache + Papilledema.

Cancer Risk: Endometrial, Breast, Colon, Esophageal (Adenocarcinoma).