CHAPTER 11

ENDOCRINE PHARMACOLOGY

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ABOUT ANTIDIABETIC DRUG

Diabetes Mellitus is a disease that occurs as a result of absolute or relative deficiency of insulin that results in metabolic and vascular abnormalities. There are several forms of diabetes, the most prevalent of which are type 1 and type 2. Type 2 diabetes is commonly referred to be a "lifestyle" disease since it is more common in persons who do not exercise enough, eat an unhealthy diet, and are overweight. During the second half of pregnancy, gestational diabetes develops. Diabetes can also be caused by pancreatic disease or injury, Cushing's syndrome, acromegaly, and a few uncommon hereditary types. It is a chronic (lifelong) illness.

Diabetes Mellitus has been associated to an increased risk of heart attacks, strokes, poor blood circulation in the legs, and eye, foot, and kidney problems. Early detection and tight control of blood sugar, blood pressure, and cholesterol levels can aid in the prevention or treatment of diabetes.

The etiologies include Obesity (because chronic calorie intake and prolonged stimulation of b cell causes a decrease in insulin receptor and also adipose tissue and muscle are less sensitive), hereditary, damage of pancreatic tissue, diabetogenic hormones (like growth hormone, thyroid, epinephrine), diabetogenic drugs like Thiazide diuretics, epinephrine, phenothiazines.

Other factors like Gestation diabetes, diagnosed for the first-time during pregnancy is known as gestational diabetes (gestation). Gestational diabetes, like other types of diabetes, affects how your cells use sugar (glucose). High blood sugar levels caused by gestational diabetes can harm your pregnancy and your baby's health. While any pregnancy issue is alarming, there is some positive news. You can help control gestational diabetes during pregnancy by eating healthy meals, exercising, and taking medication if necessary. Blood sugar control can help you and your baby stay healthy and avoid a traumatic birth. When you have gestational diabetes during pregnancy, your blood sugar levels usually return to normal soon after birth. However, if you've had gestational diabetes, you're more likely to develop type 2 diabetes. You'll have to undergo modifications testing.

Symptoms of gestation diabetes is majority of the time has no visible indications or symptoms. Symptoms include increased thirst and more frequent urination. The common Signs and symptoms of diabetes and gestation diabetes include polydipsia, polyphagia, polyuria, dehydration due to glucosuria. Diabetes has dangerous complications: including ketoacidosis (in types I), hyperglycemic osmolal non ketotic coma (in type II), cardiovascular (like atherosclerosis, myocardial infarction, peri-

pheralarterialin sufficiency, Anemia, Hypertension, stroke), nephropathy, retinopathy, and neuropathy.

It can be **classified** as**:**

Type I: IDDM (or Juvenile type) occurs predominantly in children and young adults who have no insulin secretion and

Type II: NIDDM (or maturity onset type) usually occur after the age of 40years.

Diabetic ketoacidosis (DKA) is serious complication of diabetes. It is severe metabolic disturbance due to insulin deficiency, which results in hyperglycemia, ketonemia and later acidosis. It is characterized by headache, nausea, vomiting, rapid pulse, dry skin, deep breathing, and change in mentation. Management includes Regular (soluble) insulin IV infusion, treatment of dehydration and precipitating factor.

Hypoglycemic Coma is more serious complication which usually occurs due to excess dose of insulin which produces severe lowering of blood glucose that may leads to coma.

The Sign /Symptom are mental confusion, in coordination, paresthesia, convulsion, coma and Signs of sympathetic over activity. The aim of treatment is to restore blood glucose to normal by giving glucose 50% 20 – 100 ml IV, or glucagon 1mg iv, im, sc

Antidiabetogenic drugs

INSULIN

Insulin is a two-chain polypeptide having 51 amino acids and MW 6000 Dalton.

The A chain has 21 while B chain has 30 amino acids. 1 U insulin is secreted per hour by human pancreas

Place in therapy:

Mainstay in the management of DM (type I & type II also)

Sources include pork or beef, combination of pork and beef and also human insulin (Recombinant DNA technique)

Actions:

- Insulin lower blood glucose level through increasing utilization of glucose by peripheral tissue and promoting synthesis and storage of glycogen

- The main actions of the hormone are exerted on metabolism of carbohydrate (CHO), fat and protein in liver, muscle & adipose tissue.

Site & route

- **Site :** abdomen, thighs, arms, buttock
- **route:** intravenous, subcutaneous

Effects of insulin

Insulin dosing

- Single daily injection of intermediate acting insulin
- Multiple injection (basal-bolus) – Short acting insulin before meals with intermediate of long-acting insulin once or twice daily Two-daily injections of intermediate acting insulin [split mixed regimen: 30:70 (regular: NPH)]
- Three daily injection of short acting (or ultra-short acting) insulin in combination with a single injection of long-acting insulin

POINTS TO PATIENT ON DISCHARGE MEDICATIONS

Human insulin 40 IU + isophane insulin (NPH)70%+ neutral insulin Ing.30%vial (Inj. H. Mixtard) (30/70) 22-0-11 units SC ½ hour BF

- This is to reduce your elevated blood sugar levels
- Take half an hour before food
- It may cause low blood glucose level so please carry sugar candies and have it immediately when ever you have dizziness.
- Keep insulin refrigerated, if open, use it only for 30 days
- Roll the bottle of insulin between your hands gently to mix the contents.
- Remove the pen cap.
- Check the insulin (amount and appearance).
- Clean the injection site with a BD alcohol swab.
- Attach the BD pen needle and remove both caps.
- Prime the pen.
- Dial the dose and inject.
- Remove the needle from the pen and dispose of properly. Put the cover back on the pen.

Carbohydrate metabolism

Liver: it increases glycogen synthesis from glucose and glucose utilization while decreases gluconeogenesis and glycogenolysis Muscle: it increases glucose uptake, glucose utilization and glycogen synthesis. Adipose tissue: it increases glucose uptake and glycerol synthesis (esterifies fatty acid)

Fat metabolism

Liver: it increases lipogenesis Adipose tissue: it increases synthesis of triglycerides and synthesis of fatty acid Protein metabolism Liver: it increases protein catabolism Muscle: it increases aminoacid uptake and protein synthesis Other metabolic effect: It increases uptake of K^+ and Ca^{++} into cells and synthesis of nucleic acids

There are some factors that increase insulin demand: like Infection, surgery, pregnancy and drugs (those that antagonize actions of insulin glucocorticoids, thyroid hormone, and adrenaline) Types of insulin preparation: Short acting (rapid onset): Eg Regular Insuline Intermediate acting Eg Lente insuline, NPH insulin Long acting E.g Protamine Zn insulin

Table 11.1: Types of Insulin

Types	Route	Onset (hrs)	Duration (hrs)
Regular insulin	IV, SC, IM	¼ - 1	5 – 7
Lente insulin	SC, IM	1 – 1½	18 – 24
Protamine Zn insulin	SC, IM	4 – 8	36

Table 11.2: Types of Insulin Preparation

Type	Onset (hrs)	Peak (hrs)	Duration (hrs)	Appearance
Ultra-short acting **(Aspart, Lispro & Glulisine)**	15-30 min	1-2 hrs	3-5 hrs	Clear
Short-acting **(Regular, semi-lente)**	0.5-1.0	2-3	3-6	Clear
Intermediate acting **(NPH, Lente)**	2-4	6-10	16-24	Cloudy
Long acting **(Ultralente, Glargine)**	4-6	18	24-36	Cloudy (u) Clear (g)

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Important point: - It is only regular insulin that can be given by intravenous route.

Therapeutic use -IDDM, NIDDM (not controlled by diet and oral hypoglycemic agents), diabetic ketoacidosis, Control of diabetes in pregnancy, during surgery and in infections.

They are also used in the treatment of hyper kalmia due to renal failure

Adverse Reaction: can be categorized as

Local: Atrophy or hypertrophy at site of injection, local hypersensitivity and secondary infections.

Systemic: Hypoglycemic coma and Immunologic reaction like hypersensitive and insulin resistance

ORAL HYPOGLYCEMICS

These are drugs administered orally to lower blood glucose level used in mild diabetes. They are grouped as Sulphonylureas and Biguinides.

Alpha glycosidase inhibitors

- **Alpha -**glycosidase inhibitors competitively inhibit the glycosidase enzymes in the gut that digest dietary starch and sucrose.
- Acarbose 25 mg tid
- Miglitol 25 mg tid
- To be taken with first bite of food
- **ADRs :** flatulence, abdominal pain, diarrhea
- **Place in therapy:** for patients inadequately controlled on diet

Thiazolidinediones

- Agonist of PPAR gamma. Increases skeletal muscle cell sensitivity to insulin and decreases hepatic glucose production
- Rosiglitazone 4mg QD
- Pioglitazone 15-30 mg OD
- **ADRs:** oedema, headache, abd pain, myalgia, liver impairment
- **Place in therapy:** should be offered to patients in combination with a sulphonylurea or metformin if uncontrolled blood sugar with these agents. Like the biguanides, this class of drugs does not cause hypoglycemia

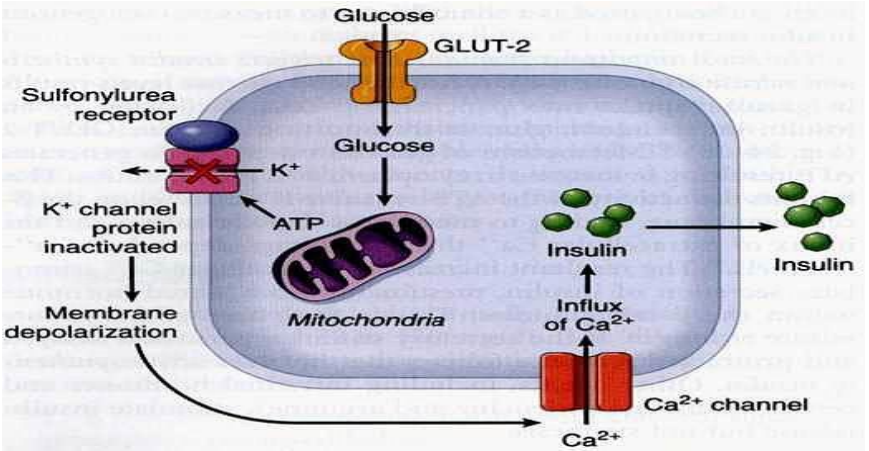

Fig 11.1: Sulphonyl Ureas

These compounds are chemically related to sulphonamides.

First generation: Tolbutamide, Chlorpropamide

Second generation: Glibenclamide, Glipizide

Mechanism: Hypoglycemic action is due to Stimulation of insulin release from b cell, Depression of glucagon secretion, Increase number of insulin receptor, Reduce insulin output from liver (Decrease hepatic gluconeogenesis and glycogenolysis)

Pharmacokinetics: They are rapidly absorbed from the gastrointestinal tract. They are also extensively plasma protein bound and are mainly metabolized in the liver.

Use: Mild diabetes mellitus in old patients (type II)

Adverse reaction: The toxicity of these compounds is remarkably low. The important toxic effects include: hypoglycemia, allergic skin rash and bone marrow depression, cholestatic jaundice (esp. chlorpropamide)

Adverse effects: Gastric irritation, prolonged hypoglycemia (esp. chlorpropamide), large doses confusion, vertigo, ataxia, leucopenia, aggranulocytosis, thrombocytopenia, and teratogenicity. Nonspecific side effect**,** nausea, vomiting, diarrhea, weight gain, Hypersensitivity

Drug interaction:

1. Hypoglycemia is enhanced by sulphonamides, phenylbutazone
2. Alcohol produces "Disulfirum" like action (flushing of the face, severe headache, vomiting etc.)

3. Sulphonyl ureas increase anticoagulant effect of oral anticoagulant
4. Thiazides oppose the action of sulphonylureas.

Biguinides

They potentiate the hypoglycemic action of insulin and sulphonyl ureas but they don't produce clinical hypoglycemia in diabetics.

Biguanides include drugs like metformin and phenformin

- Metformin 500mg / 850 mg
- Increased insulin receptor binding, stimulation of tissue uptake of glucose, reduced GI absorption of Carbohydrates, inhibition of hepatic gluconeogenesis
- Maximum dose: 2000mg / day
- ADRs: GI disturbances, lactic acidosis.
- Does NOT cause hypoglycemia or weight gain
- Place in therapy: useful in obese patient as it does not cause weight gain. Can be used along with diet as second line therapy in patients not adequately controlled on diet alone. Valuable when prescribed in combination.

Mechanism: They do not stimulate the release of insulin. They increase glucose uptake in skeletal muscle, and have effects on glucose absorption and hepatic glucose production. They also enhance anaerobic glycolysis.

Pharmacokinetics: Phenformin and metformin are rapidly absorbed from the gastrointestinal tract. Metformin is largely excreted unchanged in the urine and has a longer duration of action.

Side effects: Nausea, vomiting, anorexia, diarrhea, abdominal cramp, lactic acidosis (esp. phenformin)

Use: Obese diabetics (uncontrolled by diet alone), Supplement to sulphonyl urea.

Note: Metformin is also prescribed for PCOD (Polycystic Ovarian Disease)

Contraindication: Diabetes with hepatic, renal insufficiency, In IDDM, NIDDM (with infection, fever, surgery) and during pregnancy

They have no value in diabetes complicated by acidosis or coma

OXYTOCICS

These are group of drugs that cause contraction of the uterus.

Oxytocin

1. **Actions:** Oxytocin stimulates the uterus and cause physiologic type of contraction
2. It also causes ejection of milk through contraction of the myo-epithelial cells around the alveoli of the mammary gland.

Pharmacokinetics: It is inactivated orally and absorbed rapidly after intramuscular administration. It can also be absorbed from nasal and buccal membrane.

Use: Induction of labor in women with uterine inertia, Relief of breast engorgement during lactation (few minutes before breast feeding) as nasal spray, postpartum hemorrhage.

Side effect: Oxytocin may cause over stimulation and leads to rupture of the uterus in the presence of cephalo-pelvic disproportion. Therefore it's contraindicated in woman with uterine scar. When given intravenously may cause water retention leading to water intoxication.

Prostaglandins

They induce labor at anytime during pregnancy but most effective at the third trimester. In female reproductive system prostaglandin E & F are found in ovaries, endometrium and menstrual fluid which is responsible for initiating and maintaining normal birth process. PGF, $PGF_{2\dot{\alpha},}$ PGE stimulate both the tone and amplitude of the uterine contraction.

Adverse reaction: nausa, vomiting, headache, diarrhea, fever, etc.

PGs should be used cautiously in the presence of hypertension, angina, and diabetes. They are contraindicated in the presence of cardiac, renal, pulmonary or hepatic disease

Ergometrine

It is one of the ergot alkaloids with the ability to cause contraction of the uterine smooth muscle.

It causes sustained uterine contraction. It is completely absorbed after subcutaneous and intravenous administration. It is metabolized in the liver and eliminated in the urine .Liver damage enhances the toxicity of ergot alkaloid.

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Use: after delivery of placenta if bleeding is severe (Prevent postpartum bleeding) Adverse effect: Nausa, vomiting but serious toxic effects are rare.

I. Female Sex Hormones and Hormonal Contraception Oestrogens

These drugs can be classified into three groups.

1. Natural – estradiol, esterone, estriol
2. Semisynthetic – Ethnylestradiol
3. Synthetic: Diethylstibosterol

Natural

Estradiol: Estradiol is most potent, major secretory product of ovary.It is oxidized into esterone by liver; estrone is hydrated to estriol and synthesized by ovarian follicle, adrenal cortex, fetoplacental unit, and testis. Androgen and testestrone are precursor for estrogen. Certain tissue can make estrone from androgen.

Semisynthetic

Ethylestadiol: Highly potent, effective orally

Absorption and Fate**:** It is absorbed from GI and skin and rapidly metabolized in the liver

Physiologic actions:

Genital system

Ovary: estrogen affects the ovary through indirectly influencing the secretion of gonadotrophin

Uterus: it affects the 'proliferative phase' of the endometrium and also increases the growth and sensitivity of myometrium for oxytocin.

Cervix: it makes cervical mucus thin and alkaline

Vagina: Stratification, cornification and glycogen deposit is affected by estrogen.

Breast

Estrogen causes the growth of gland and duct system

Anterior pituitary

Estrogen inhibit release of gonadotrophins (FSH, LH)

Metabolic action:

a) Retention of salt and water
b) Plasma lipid level: it increases the level of high density lipoprotein and triglycerides while decreases the level of low density lipoprotein and cholesterol.
c) Increases Ca^{tt} bone deposition
d) It has a mild anabolic action

Blood coagulation

Enhance level of factor II, VII, IX, X so, increase the coagulability of blood and may predispose to thromboembolic condition

Therapeutic use: contraceptive in combination with progestogens, Functional uterine bleeding, Dysmenorrhea, Alleviation of menopausal disorder, Osteoporosis, Replacement therapy in ovarian failure, Prevents senile and atrophic vaginitis

Side effects: Thromboembolism, Sodium and water retention, Withdrawal bleeding, nausea, endometrial carcinoma

Contraindication: History of thromboembolism condition, Undiagnosed uterine bleeding, endometrial Carcinoma, liver disease

PROGESTOGENS

Progestrone is natural occuring progestational hormone.it is synthesized by corpus luteum, placenta, adrenal cortex, testis. It is less effective orally due to complete metabolism by liver so it's given through intramuscular route.

Actions on genital organs:

Ovary - Inhibition of ovulation

Uterus - converts the endometrum for secretory phase and makes the myometrium less sensitive to oxytocin. It also causes relaxation of the uterus in late pregnancy.

Metabolic actions:

a) Thermogenic action
b) Competes with aldosterone at renal tubule so inhibits sodium reabsorption.

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Synthetic/Senisynthetic progestogens:

Derivative of progestrone: Hydroxyprogesterone capriot/medroxyprogestrone

Derivative of testestrone: Dimethisterone

Nortestrone: Norethisterone

Therapeutic use: Hormonal contraception, functional uterine bleeding, dymennorrhea Ammenorrhea, Endometrial Carcinoma, Premenustral tension

ORAL CONTRACEPTIVES

These are drugs taken orally to prevent conception. They are available in the following forms:

1. Combined regimen type
2. sequential regimen type
3. triphasic pill regimen

Combined regimen: involves the administration of pills containing combination of Estrogen and Progestogen. They are administered starting 5th day of menustral cycle for 21 days.

They can also be classified as fixed dose combination (monophasic), biphasic and triphasic pills. Fixed dose combination: the commonest procedure is to administer one pill containing both an estrogen and progestin daily at bed time for 21 days. In biphasic and triphasic pills: these are combined oral contraceptive pills containing varying proportion of an estrogen and a progesterone designed to stimulate the normal pattern of menustral cycle.

Formulation

a) low estrogen, low progesterone- (0.03mg ethinylestradiol+0.15 mg norgestril)
b) Low estrogen, high progestogen- (0.03 mg ethinylestradiol + 1.5 mg norethindrone)
c) High estrogen, high progesterone- (0.05 mg ethinylestradiol + 0.5 mg norgestril)

Mechanism: includes inhibition of release of FSH and LH, increase viscosity of cervical mucus endometrial changes, interfere with contraction of cervix, uterus and fallopian tube

Single Entity preparation

A. Continuous progestrone

i. Oral progesterone Norethindone (Norgestril)

ii. Depot IM injection of long acting progestogen.

Example: Medroxyprogestrone acetate (Depoprovera®)

iii. Subcutanous implant L – norgestril (Norplant®)

Mechanism: It makes cervical mucus thick, though & hostile and also alter endometrial wall

B. Post coital "morning after" pill

Oestrogen like Diethyl stilbosterol used within 72 hrs

Combined oral contraceptive pills can also be used.

Side effects of oral contraceptive: Thromboembolic complication, Weight gain & fluid retention, Menstrual disorder, Breast tenderness & fullness, Skin changes, Nausea & vomiting, Depressed mood, Reduced lactation

Beneficial effects of estrogen /progesterone oral contraceptive

1. Reduced risk of endometrial Carcinoma, ovarian cyst
2. regular Menses, No excessive blood loss
3. Less premenustrual tension and dysmennorrhea
4. Relief of endometriosis

Contraindication: In patients withcardiovascular diseases (hypertension, coronary heart disease)

Thromboemolic disease, breast Cancer, diabetes mellitus, liver disease, women > 35 years (esp. smokers and hypertensives)

Drug interaction:

1. Effect reduced when taken with enzyme inducers like Rifampicin, Phenytoin, and Phenobarbitone etc. It may result in unexpected pregnancy and spotting.
2. Oral contraceptive antagonize the effect of Coumarin anticoagulant and some antihypertensives Ovulation inducing drug

These are drugs used in the treatment of infertility due to ovulatory failure.

Clomiphen

It is antiestrogenic drug. It interferes with estrogen feedback inhibition at hypothalamus and anterior pitutary so enhance secretion of FSH, LH causing ovarian stimulation which finally leads to ovulation.

ADRENCORTCCAL HORMONES

Adenocortical hormones control the metabolism of carbohydrate (CHO), protein, fat and water/electrolytes

Adencortical hormones are classified into:

a. Glucocorticoid
   - Cortisone
   - Hydrocortisone (Cortisol)
b. Mineralocorticoid
   - Aldosterone
   - Desoxycorticosterone
c. Sex Hormone
   - Estrogen
   - Androgen

Glucocorticoids

The important glucorticoid secreted in man is hydrocortisone. It posseses some mineralocorticoid activity as well. Cortisone is less potent and is converted to hydrocortisone by liver.

They are classified as

1. Short acting e.g cortisone, hydrocortisone
2. Intermediate acting e.g predinsolone, triamcinolone
3. Long acting e.g dexamethasone, betamethasone)

Dexamethasone and betamethasone have got a high glucorticoid activity while cortisone and hydrocortisone have high mineralocorticoid action. Therapeutic activity in inflammatory disorder is proportional to the glucocorticoid activity.

Actions on CHO metabolism:

- Anti-insulinic effect
- decreases Peripheral utilization of glucose,
- increases gluconeogenesis
- promote glycogen storage

Protein metabolism:

- Inhibit protein synthesis,
- Increases catabolism

Fat metabolism:

- Interferes with fat storage causing deposits with characteristic distribution (neck, supraclavicular area, and face Electrolyte and H_2O metabolism
- Sodium and water retention
- Hypo-kalmia

Suppression of pituitary adrenocortical system CNS: Euphoria and stimulation

CVS: Restore vascular reactivity

GIT: Increase gastric acid secretion

Blood: Increase number of RBC, Hypercoagulability

Uric acid: Increased excretion

Calcium metabolism: increased Ca^{++}excretion, interfere with Ca^{++} absorption

Anti-inflammatory: Inhibit exudation, capillary dilatation, migration of phagocyte, fibroblast, inhibit fibrous tissue formation

Antiallergic: through inhibition of antibody production suppress tissue inflammatory response.

Absorption and fate: It has fair absorption, bound to a -globuin (transcortin).And in the liver, cortisone is converted into hydrocortisone.

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Therapeutic use

1. Replacement therapy: In Addisons disease and Addisonian crisis
2. Anti-inflammatory: in conditions like Collagen disease (rheumatoid carditis, arthritis),
3. Hypersensitivity reactions: (Bronchial Asthma, status asthmatic), Blood disease due to circulating antibodies (autoimmune disease), Skin disease (eczema), Eye disease (allergic inflammation of the eye), Nephrotic syndrome, Acute gout.
4. Immunosuppression: In tissue / organ transplantation.

Precautions

- Check weight for fluid retention
- Test urine for sugar
- Follow blood pressure through measurement and check bones by X-ray for osteoporosis
- Doses should be tapered slowly (Don't stop abruptly)
- Increase dose in surgery, infection
- Encourage diet rich in K^+, protein and adequate calcium, low Nacl
- Rule- out infection before initiation of treatment

Side effects

- Due to prolonged use: Weight gain and edema hypokalmia, hyperglycemia, osteoporosis, psychiatric disturbance, susceptibility to infection (like TB), peptic ulceration, cushing syndrome, retarded growth
- Complication with rapid withdrawal results in adrenacortical insufficiency due to depression of adrenocortical activity

Contraindication

They are contraindicated in patients with peptic ulcer disease, acute infection like active tuberculosis, diabetes mellitus, psychosis, pregnancy

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Mineralocorticoid

Aldosterone

It is the main mineralocorticoid of adrenal cortex. It increases absorption of Na at distal tubule and increases K^+ excretion. They are not widely used in therapeutics rather its antagonists are of value in cases of edema.

Thyroid and Antithyroid Drugs

They inhibit the function of the thyroid gland and used in hyperthyroidism.

Antithyroid drugs include:

1. Thiourea compounds, e.g. , propylthiouracil, methimazole, carbimazole
2. Ionic inhibitors, e.g. , potassium percholate, potassium thiocyanate
3. Iodide, e.g. , Lugol's iodine, potassium iodide
4. Radioactive iodine (^{131}I)

Thiourea Compounds

Inhibit the formation of throid hormone through inhibiting the oxidation of iodide to iodine by peroxidase enzyme and blocking the coupling of iodothryosines to form iodothyronines.

They are contraindicated in pregnant and lactating women.

Toxicities include drug fever, skin rashes, increased size and vascularity of the thyroid gland, and agranulocytosis.

Ionic Inhibitors

Potassium percholate prevents the synthesis of thyroid hormones through inhibition of uptake and concentration of iodide by the gland. It has the risk of aplastic anemia, therefore no longer used in the treatment of hyperthyroidism.

Iodides: Improve manifestations of hyperthyroidism by decreasing the size and vascularity of the gland so they are required for preoperative preparation of the patient for partial thyroidectomy.

Iodides act through inhibition of the "protease" enzyme which releases T_3 and T_4 from thyroglobulin, and organification.

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Radioactive Iodine:

It is used in hyperthyroidism as sodium ^{131}I orally. It is trapped and concentrated as ordinary iodine, which emits beta rays that act on parenchymal cells of the gland.

It is contraindicated in pregnancy and lactation as it affects thyroid gland in the fetus and the infant. Its important toxicity is hypothyroidism.

Propranolol

This is an important drug which controls the peripheral manifestations of hyperthyroidism (tachycardia, tremor). In addition, it decreases the peripheral conversion of T_4 to T_3.

Thryoid Storm (Crisis)

This is a sudden acute exacerbation of all the symptoms of thyrotoxic which rarely occur after thyroidectomy. Manifestations include hyperpyrexia, gastrointestinal symptoms, dehydration, tachycardia, arrhythmia, restlessness, etc. which may progress to shock and death.

Management: It consists of infusion of intravenous fluids, supportive management, and also administration of propylthiouracil, sodium iodide, hydrocortisone, and propranolol.

- Non Pharmacologic therapy:
- Diet: saturated fat should be minimized, fibers (20-35 g), protein (10-20%), carbohydrate (60-70%), fat (20-30%)
- Exercise : walking

Questions

i. List the important organ/system effects of insulin.
ii. Write about the clinical aspects of oral antidiabetic drugs.
iii. Discuss the mechanism and beneficial effects of combined oral contraceptive pills.
iv. Discuss the pharmacological action and adverse effects of glucorticoids.
v. What do you mean by anti thyroid drugs?

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Practical Case Chart of any Patent for Pharmacy Practice (DM with nephropathy)

PATIENT PROFILE FORM ABC HOSPITAL

<table>
<tr><td colspan="2">PATIENT NAME: X HOSP.
NO:02203960 AGE: 62 WEIGHT:53 kgs
SEX: M/F: M</td><td colspan="2">DATE OF ADMN: 13/9/2021
DATE OF DISCGE: 17/9/2021</td></tr>
<tr><td colspan="4">COMPLAINTS ON ADMISSION: chest pain × 1 month
Excessive thrust from 1 week, Weakness from 3 days
Frequent urination</td></tr>
<tr><td colspan="4">MEDICAL HISTORY: DM type 2 × 13 yrs; h/o varicose vein.
MEDICATION HISTORY: Riomet 500 mg (metformin) (BID); using crepe bandages.
SOCIAL HISTORY:NAD
FAMILY HISTORY: H/o varicose vein for mother, sister and son.
PREVIOUS ALLERGIES: NAD</td></tr>
<tr><td colspan="4">PHYSICAL EXAMINATION:
GENERAL - P I C C L E
VITAL SIGNS - PR.-84/min,BP-130/80mm Hg, RR-18/min.
HEENT -NAD
CVS - S1S2 (+)
RS - NAD
GIT - NAD
GU - burning micturition
EXT -tingling sensation +
CNS - NAD</td></tr>
<tr><td colspan="4">PROVISIONAL DIAGNOSIS:DM type 2, Varicose Vein, Diabetic Nephropathy</td></tr>
<tr><td colspan="3">ROUTINE BIOCHEMICAL INVESTIGATIONS</td><td>HAEMATOLOGY:</td></tr>
<tr><td>Urea: 25mg/dl
S.Cr : 2.4mg/dl
Cr.Clearance:23.92</td><td>RBS:
Tch :198mg/dl</td><td>Alb:
Glob:
AST:</td><td>RBC : Retics:
WBC:
5500cells/mm^{3}Hb:14.4gm/dl</td></tr>
</table>

ml/min Na: 133m.eq/l K: 4.0m.eq/l FBS: 288mg/dl PPBS: 409mg/dl	TGs : 410mg/dl T Bili: D Bili: T. Prot:	ALT: ALP:	N: PCV: L: MCV: M: MCH: E: MCHC: B: ESR: 10mm/hr Platelets: 16500 cells/mm^3
URINE ANALYSIS		**OTHERS**	
pH: WBC: Protein:450mg/dl RBC: Sugars: ++ EP. Cells: Blood: Casts: Crystals:		LDL: 130mg/dl HDL: 46 mg/dl TC/HDL:4.3 PSA: 0.345ng/ml	
FINAL DIAGNOSIS: Type 2 DM , Diabetic Nephropathy			

DRUG TREATMENT CHART

DRUG WITH DOSE & ROUTE		13/9	14/9	15/9	16/9	17/9	DAY	INVESTIGATIONS
GENERIC NAME	BRAND NAME	1	2	3	4	5	No.	Details
1.Human insulin	Inj H.Actrapid	√ (0-0-6 units)	√ 12-12-8	√ 16-12-18	√ 16-14-20	√	D2	FBS: 191mg/dl. Patient had weakness PPBS: 268 mg/dl
2.Enalapril maleate	Tab. Envas 2.5 mg (1-0-0)	√	√	√	√	√	D3	FBS: 257 mg/dl PSA: 0.345 ng/ml
3.Aspirin	Tab.Ecospr in (enteric coated)	√	√	√	√	√	D4	BP: 150/90mm of Hg

4.Rosuvastatin	75mg(0-1-0) Tab.Rosavel 10mg HS	×	×	√	√	√	D5	Head ache present FBS: 210 mg/dl Urine protein: 350 mg/dl PPBS: 216 mg/dl BP:140/90mm of Hg Patient better. No fresh Complaint FBS: 160 mg/dl BP:130/80 mm of Hg Patient improved.
	DISCHARGE MEDICATIONS: **\Human insulin 40 IU + isophane insulin(NPH)70%+ neutral insulin Ing.30%vial [** Inj. H. Mixtard] (30/70) 22-0-11 units s/c ½ hr b/f food. • **Enalapril maleate[**Tab. Envas] 2.5 mg 1-0-0 • **Aspirin[**Tab. Ecosprin] 75 mg 0-1-0 **Rosuvastatn[**Tab. Rozavel] 10 mg H.S.							FOLLOW UP/REVIEW: To review in MED 5 OD after 2 weeks with FBS, PPBS.