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To Dispel Darkness of Diabetes

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DIABETIC EYE DISEASES

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Diabetes Mellitus is one of the leading causes of preventable blindness worldwide. Patients with diabetes may develop various eye complications such as cataract, glaucoma, neuropathies, diabetic retinopathy and retinal vascular occlusions. However, the most common and potentially most blinding of these complications is diabetic retinopathy. Routine eye examination for early detection and timely treatment can prevent severe vision loss from diabetic eye complications.

Diabetic Retinopathy

Diabetic retinopathy is caused by damage to the blood vessels of the light sensitive tissue at the back of the eye, called retina. In initial stages diabetic retinopathy usually causes no symptoms, however in more advanced stages, patient may have symptoms which include blurred vision, floaters, distortion and progressive loss of vision.

Prevalence of Diabetic Retinopathy

Based on various studies conducted across the world the global prevalence of diabetic retinopathy has been estimated to be around 30% to 40% and prevalence of sight threatening retinopathy around 8%. The highest prevalence was found in the younger onset group using insulin. In Indian studies however the prevalence of diabetic retinopathy has been shown to be around 10-20% and sight threatening retinopathy 5-6%. The cause for lower prevalence in Indians is unknown. Recent studies on pathophysiology of underlying diabetic retinopathy and dramatic changes in the field of retinal imaging with high quality stereoscopic fundus photography and Optical coherence Tomography (OCT) have furthered our understanding of retinal diseases. In addition, several clinical trials have provided evidence based treatment strategies for diabetic retinopathy, including systemic management and ocular treatment using anti- vascular endothelial growth factor (anti- VEGF) agents which have provided a dramatic shift in management of diabetic retinal diseases. These recent advances will be further discussed in next few sections.

Pathogenesis

Diabetic retinopathy which was classified as a microvascular complication of diabetes is now recognized as a neurovascular complication resulting from disruption of retinal neurovascular structure and function. Neuronal cell apoptosis in diabetic retinopathy is due to a combination of various ocular factors such as increased oxidative stress, increased inflammation, altered glutamate excitations and systemic factors such as hyperglycemia, dyslipidemia and insulideficiency. These also lead to structural changes in small blood vessels of retina such as endothelial damage, loss of pericytes, basement membrane thickening changes in RBC's and platelets which lead to breakdown of blood retinal barrier.

Risk Factors of Diabetic Retinopathy

DURATION OF DIABETES:

Prevalence of diabetic retinopathy is significantly related to duration of diabetes with prevalence of around 25% at 5 years, 60% at 10 yrs and 80% at 15 yrs from onset of diabetes mellitus respectively. Each year of diabetes mellitus represents a 6% increase in chance of diabetic retinopathy.

BLOOD SUGAR:

Individuals with HbA1c > 7% are more likely to develop diabetic retinopathy.

BLOOD PRESSURE:

Good blood pressure control, <150/90 decreases the incidence and slows rate of progression of Diabetic Retinopathy.

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SERUM LIPIDS:

Retinopathy progression slowed in patients with adequate control of dyslipidemia.

GENETIC FACTORS:

There is increased risk of retinopathy in relatives of diabetic retinopathy patients.

PREGNANCY:

Pregnancy may accelerate progression of retinopathy. Therefore diabetic women who become pregnant should have regular comprehensive eye examinations throughout pregnancy and one year postpartum.

OTHER FACTORS:

Renal disease, as manifested by microalbuminuria and proteinuria is one of the significant risk factor for onset and progression of diabetic retinopathy.As regards to obesity, smoking and anaemia; there is inconsistent evidence of positive relationship of these factors with diabetic retinopathy. However, they are risk factors for cardiovascular diseases.

Classification of Diabetic Retinopathy

Diabetic Retinopathy is broadly classified into non proliferative diabetic retinopathy (NPDR) and proliferative diabetic retinopathy (PDR)

Non Proliferative Diabetic Retinopathy (NPDR)

Lesions of NPDR include micro- aneurysms, hemorrhages, hard exudates, cotton wool spots (accumulation of axoplasmic debris within ganglion cell axons), venous beading and looping and intraretinal microvascular abnormalities.

Proliferative Diabetic Retinopathy (PDR)

It is characterized by new vessel growth on the optic disk or elsewhere on the retina. The development of new vessels can lead to complications like preretinal hemorrhage, vitreous hemorrhage (VH), fibrous proliferation and tractional retinal detachment. On the basis of the extent and location of these lesions, PDR is classified as early PDR or high risk PDR. Early PDR is new vessels with criteria not met for high risk PDR. High risk PDR include NVD(Neovascularisation at disc) which are larger than one third disc area and are within one disc diameter of optic nerve head or NVD with vitreous or preretinal hemorrhage or NVE (neovascularisation elsewhere) $\geq$ 1/2 disc area in size and associated with vitreous or preretinal hemorrhage. The ETDRS severity scale is a gold standard for grading severity of diabetic retinopathy, however its use is difficult in everyday practice as it requires comparison with standard photographs and definition of levels of severity of DR are detailed and complex to remember. Thus a diabetic retinopathy severity scale was developed at the International Congress of Ophthalmology in 2002. This international classification defines five clinical levels of diabetic retinopathy:

1) No apparent retinopathy.
2) Mild NPDR - microaneurysm only.
3) Moderate NPDR - more than microaneurysm only,but less than severe NPDR.
4) Severe NPDR - any of the following with no PDR:
   i. >20 intraretinal hemorrhages in each of the four quadrants.
   ii. Definite venous beading in 2 or more quadrants.
   iii. Prominent IRMA in 1 or more quadrants.
5) PDR - One or more of: neovascularisation, vitreous hemorrhage or preretinal hemorrhage.

Classification of Diabetic Macular Edema (DME)

DME can be present with any level of diabetic retinopathy.DME occurs due to increased permeability of retinal capillaries. Not all macular edema result in visual impairment. The ETDRS study proposed a term Clinically Significant Macular Edema (CSME). Diabetic macular edema is termed CSME if any one of the following three criteria is present:

- Thickening of the retina $\leq$ 500µm from the centre of the macula

- Hard exudates at or within 500µm from macular centre associated with thickening of adjacent retina
- Retinal thickening one disc area or larger in size, any portion of which is within one disc diameter of centre of macula.

The International Classification DME severity scale separate eyes with apparent DME from those with no apparent thickening or hard exudates in the macula. For macular edema, DME is classified as:

- Mild - not threatening centre of macula.
- Moderate -threatening centre of macula.
- Severe - involving centre of macula.

The International classification makes clinical use easier and more uniform among practitioners.

Management of Diabetic Retinopathy

Detection of Diabetic retinopathy:

Diabetic retinopathy can be asymptomatic even in advanced stages. Therefore diabetic patients should undergo regular comprehensive eye examinations. Detection of diabetic retinopathy is best achieved by ophthalmoscopic examination through a dilated pupil by a retina specialist. However a significant number of individuals with diabetes mellitus who are at risk of visual loss do not have access to an ophthalmologist. In such cases, the most reliable and cost effective means of screening of diabetic retinopathy is with telemedicine based digital retinal photography, which is interpreted by trained eye care provider. Diabetic retinopathy screening should be performed at diagnosis and either yearly or second yearly thereafter in people with Type 2 DM with no signs of retinopathy. In people with Type 1 DM, baseline examination can be done at 5 yrs after diagnosis and yearly thereafter until they develop signs of retinopathy. Once patient develops sign of retinopathy, eye examination has to be done more often depending on severity of retinopathy. In pregnant women, comprehensive eye examination during first trimester and close follow up throughout the pregnancy is necessary.

Investigations:

- **Fluorescein Angiography:**

It is an established adjunct in the diagnosis and management of diabetic retinopathy. It is generally used in patients with diabetic maculopathy to identify areas of leaking microaneurysms and guide in treatment. It is also used to assess foveal avascular zone to detect macular ischemia and also to assess risk of developing PDR by identifying ischemic areas in retina. Patients with unexplained visual loss will also be benefited with flourescein angiography.

- **Optical Coherence Tomography(OCT):**

Dramatic changes have occurred in the field of retinal imaging over the last decade which has furthered our understanding of retinal diseases. OCT is one such modality. It generates cross sectional images of retina. It is used to quantify retinal thickness in different areas of retina, identify cystic spaces in macula, critical for monitoring progression and response to treatment in people with diabetic macular edema. It is also useful to detect vitreomacular traction, neurosensory detachment & macular hole.

- **B -scan ultrasonography:**

It can be used to evaluate status of retina in patients with opaque media.

- **Blood test:**

To diagnose and treat associated diseases, following blood tests may be done:

1. Fasting glucose, HbA1c for diabetes
2. CBC to diagnose anemia
3. Serum creatinine to diagnose diabetic nephropathy
4. Serum lipids to diagnose dyslipidemia

- **Wide angle fundus photography :**

Helps in detecting clinically silent microvascular lesion and peripheral non perfusion areas

Treatment:

Systemic measures:

Good Metabolic control:

Studies like DCCT and UKPDS provide definitive evidence that good control of

glycemia, hypertension and lipids reduces the risk of development and progression of diabetic retinopathy. However, there is a risk of hypoglycemia with intensive treatment. Each percent reduction in HbA1c lowers the risk of retinopathy by 30-40 % and the effect is long lasting. Treatment of associated disease like nephropathy, obesity, anemia also has shown to reduce risk of retinopathy.

Ophthalmic Measures:

Various studies such as The Diabetic Retinopathy Study (DRS) and The Early Treatment Diabetic Retinopathy Study (ETDRS) demonstrated that scatter (panretinal) photocoagulation significantly reduces the risk of severe visual loss from PDR to less than 4% if applied when an eye approaches or just reaches high risk PDR. It may be also advisable for patients with severe NPDR if they cannot follow up regularly, in PDR follow eye and in patients with concurrent diseases such as hypertension or kidney diseases.

Macular Edema

The current standard for macular edema evaluation focuses on determining presence or absence of edema involving the centre of macula. Current first line therapy for eyes with centre involving DME with visual acuity of 20/30 or worse is a regimen of repeated intravitreal injections of VEGF -inhibitors (described by the Diabetic Retinopathy Clinical Research network). Focal/ grid photocoagulations is then added secondarily as needed. This approach can limit moderate vision loss from DME to less than 5% and lead to visual improvement of 10 or more letters in more than half of the patients.

Focal laser photocoagulation may also be indicated in patients with CSME without centre involvement or in eyes with good vision or who cannot tolerate intravitreal injections and for noncompliant patients.

Four anti VEGF agents are currently available. Ranibizumab, Bevacizumab, Aflibercept, Pegabtanib sodium. Both aflibercept and ranibizumab have been FDA approved for treatment of DME, ARMD, and retinal vein occlusion. Bevacizumab has been widely used off label in the treatment of these conditions.

All 3 drugs have shown to have similar efficacy when visual acuity is better than 20/50, however when visual acuity is 20/50 or worse, aflibercept improved visual acuity more than other two drugs. If patient fails to respond to initial treatment with any one of the three drugs, they may show improved response with the other drug. Adverse effects were found to be similar in all 3 agents.

Side effects of intravitreal injection

Side effects are rare. Ocular adverse events include rare risk of endophthalmitis, vitreous hemorrhages, retinal detachment, cataract formation, and increase in intraocular pressure.

Ongoing clinical trials continue to evaluate a variety of anti- VEGF agents with different injection protocols to treat DME and PDR. Intravitreal VEGF inhibitors may be used as an initial treatment in compliant patients with PDR with close follow up.

Intraocular Steroids

Intravitreal steroids in conjunction with laser have vision improvement comparable to anti-VEGF agents but they are associated with significant side effects like increased intraocular pressure and cataract formation and have shorter duration of action. Newer sustained delivery corticosteroids like ozurdex, an extended release dexamethasone intravitreal implant and intravitreal triamcinolone acetonide are currently being used in patients with refractory DME as an adjunct to laser photocoagulation.

Surgical treatment

Vitrectomy is a surgical technique performed in advanced diabetic eye diseases such as PDR that progresses to tractional retinal detachment and in nonclearing vitreous hemorrhages. Early rather than late vitrectomy is recommended. Vitrectomy is also indicated in combined detachments, rubeosis precluding PRP, in patients of DME with evidence of vitreomacular traction who do not respond to intravitreal pharmacotherapy and laser treatment.

Other Diabetic Eye Diseases

All structures of eye are susceptible to complications of diabetes. Some of the common eye complications of diabetes will be discussed further. Diabetes affects the crystalline lens of the eyes. Cataract can occur at an earlier age and progress rapidly in patients with diabetes. Diabetes can also cause transient changes in refractive error. Open angle glaucoma is 1.4 times common in diabetic population.

Mononeuropathies of the third, fourth or sixth Cranial nerves can occur in association with diabetes resulting in extraocular muscle palsy. They are usually self-limited and resolve in 2-6 months. They can recur or develop in contralateral eye. Other potential causes of neuropathies should be ruled out. Diabetic papilopathy can occur in people with diabetes. Other causes of optic disc swelling such as papilloedema, optic nerve drusen, neoplasm, optic neuritis toxic optic neuropathies and hypertension should be ruled out. Optic disc palor can occur following remission of PDR. The cornea of diabetic person is more susceptible to infection and injury and is slower to heal after injury than a non-diabetic cornea.

Iris neovascularization is a serious diabetic complication. It can cause angle closure resulting in neovascular glaucoma. Scatter panretinal photocoagulation is the primary treatment along with antiglaucoma medications and filtration surgery when needed. Intravitreal VEGF inhibitors also help in retarding rapid regression of the neovascularization.

Future Goals

There has been a dramatic shift and remarkable improvement in prevention of visual loss from diabetic retinopathy with advent of newer imaging modalities and emergence of newer treatments with anti VEGF agents. However the need for repeated injections and unsatisfactory response in a substantial proportion of patients necessitates the development of longer acting and less invasive therapies for treatment of DME and PDR.

Several longer acting anti VEGF agents are currently under trial such as abicipar pegol, a designed ankyrin repeat protein, refillable Transscleral ranibizumab reservoir implant and an anti VEGF producing encapsulated cell chamber filled with immortalized retinal pigment epithelial cells.

Several steroid preparations are under trial such as Danazol, Loteprednol etabonate, Dexamethasone phosphate.

The identification of novel genes and understanding the pathogenic pathway underlying diabetic retinopathy will further assist in developing newer strategies for treatment of diabetic retinopathy.

As we understand capabilities of newer drugs and integrate them with currently available treatment, the future of treatment of diabetic eye diseases appears promising.

References for further reading:

1. Barber AJ, Gardner TW, Abcouwer SF. The significance of vascular and neural apoptosis to the pathology of diabetic retinopathy. Investigate Ophthalmology And Visual Science 2011; 52: 1156- 63.
2. Early Treatment Diabetic Retinopathy Study Research Group. Photocoagulation for diabetic macular edema: Early Treatment Diabetic Retinopathy Study Report No.4.International Ophthalmology Clinics. 1987; 27:265-272.
3. Wilkinson CP, Ferris FL 3rd, Klein RE,et.al.Proposed International Clinical Diabetic Retinopathy and Diabetic Macular Edema Disease Severity Scale. Ophthalmology.2003; 110:1677-1682.
4. American Academy of Ophthalmology. Preferred Practice Pattern Guidelines. Diabetic Retinopathy. September 2008.
5. Diabetic Retinopathy Study Research Group. Photocoagulation treatment of proliferative diabetic retinopathy: Clinical application of Diabetic Retinopathy Study (DRS) findings, DRS Report No.8.Opthalmology.1981; 88:583-600.
6. Ecman MJ, Aiello LP, Beck RW, et.al; Diabetic Retinopathy Clinical Research Network. Randomized trial evaluating ranibizumab plus prompt or deferred laser or trimcinolone plus prompt laser for diabetic macular edema.Opthalmology. 2010; 117:1064-1077.
7. Zorilla E, Kozak GP. Opthalmoplegia in diabetes mellitus. Annals of Internal Medicine.1967; 67:968-976.

FORUM FOR INJECTION TECHNIQUE & THERAPY EXPERT RECOMMENDATIONS (FITTER), INDIA: THE INDIAN RECOMMENDATIONS FOR BEST PRACTICE IN INSULIN INJECTION & INFUSION, 2017: PART II*

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13. Special Populations

13.1 Pregnancy

Proper education and counseling of antenatal women about the regulation of diabetes and use of insulin therapy (if needed) is very important (A3). Patients should be reassured that abdomen is a safe site for insulin administration during pregnancy (B3).

- First trimester: No change in insulin site or technique is needed (B3).
- Second trimester: Lateral parts of the abdomen can be used to inject insulin, staying away from the skin overlying the fetus (B3).
- Third trimester: Insulin can be injected in the lateral abdomen while ensuring the skin fold is properly raised (B2). Alternative sites for apprehensive patients are thigh, upper arm or buttock (C3).

13.2 Dermatological disease

Injection should not be administered into active or recently healed infections, keloids or scars. However, stable vitiligo is not a contraindication for insulin injection.

13.3 Surgical disease

Different quadrant of the abdomen should be used for insulin injection in patients with open fistulas/ ileostomies /colostomies or recent surgical wounds. An alternative approach for apprehensive patients with recent abdominal surgery is thigh, upper arm or buttock for injection.

13.4 Elderly

Elderly patients should be assisted by a caregiver and the importance of injection therapy, as well as prevention and, treatment of hypoglycemia should be emphasized (A2). A retrospective study among 3172 insulin dependent elderly patients with T2DM showed that pen devices improved insulin therapy adherence in a primarily elderly population with T2DM ($P < 0.001$).

The discreetness, simplicity, convenience of use, dosage accuracy of pen devices and they being less painful to inject allows for widespread acceptability amongst the elderly (A2).

13.5 Sensory motor impairment: Visual, tactile and lack of manual dexterity

In visually impaired patients, no visual insulin measurement devices, syringe magnifiers, needle gauges, and vial stabilizers help ensure accuracy and aid in insulin delivery. In patients with both visual and dexterity impairment, prefilled syringes may be helpful (A2). In patients with impaired hearing and those who use

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hearing aids, therapy related discussions should be conducted in a noise free environment (A2). In addition, speaking slowly and clearly with normal intonation will also be a benefit. In people with dexterity problems, use of devices with preset doses and easy featuring devices may be beneficial (A2). Pens which require low pressure should be preferred (A3).

13.6 Immunocompromised individuals

In some immunocompromised patients such as those with human immune deficiency virus (HIV) and hepatitis, superadded infection is a major concern. Hence, early initiation of insulin therapy should be considered in immunocompromised patients as it improves therapeutic outcomes. Personnel giving injections and those handling sharps are at high risk of exposure and transmission of blood borne pathogens (HIV and hepatitis) through injections and finger sticks administered to affected patients. Therefore, needles, syringes and lancets should never be reused (A2), and should be disposed off carefully.

Table 21: Recommendations in special situations

Pregnant women

- In pregnant women, injections should be given into the abdomen using a raised skin-fold (B2).
- Alternative sites may be used during the last trimester in apprehensive patients (B2).

Elderly

- Assessment of dexterity and strength of cognition, vision, and hearing is recommended before therapy initiation and during follow-up (A2).
- Encourage the use of insulin pens as elderly patients find them easier to use (A2).
- Caregivers should be educated about the importance of injection technique as well as hypoglycemia treatment and prevention (A2).
- Caregivers should be aware of the important features of the pen device such as adequate length of the device, dial visibility and ease of recapping the pen (A3).

Sensory motor impairment

- Use of injection devices with preset doses and easy handling features benefit patients with reduced dexterity (A2).
- Pre-filled syringes may be recommended for patients who have both visual and dexterity impairment (A2).
- For hearing-deficit patients, instructions should be given in a well-lit and noise-free room (A2).

Immunocompromised individuals

- Never reuse needles, syringes or lancets as there is a high risk of transmission of blood-borne pathogens (HIV and hepatitis) (A2).

14. Adverse events of faulty technique

14.1 Pain

Pain is perhaps the commonest adverse event associated with insulin use. Good injection practices can minimize or avoid injection associated pain (Table 1).

Table 22: Minimizing pain associated with insulin

Pre -injection	During injection	Post -injection
Appropriate messaging: Convey the benefits of insulin in a positive manner.	Do not raise a tight, blanched, or painful skin fold.	Release skin fold if raised, slowly, after withdrawing needle.
Selection of appropriate insulin, site, device, needles gauge & length	Allow topical alcohol (if used) to evaporate.	Follow correct site rotation policy.
Use new needle for each injection.	Avoiding injecting at hair roots and over bruised or traumatized sites.	
Use concentrated insulin if dose requirement is high.	Penetrate the skin quickly.	
Use neutral pH insulin if pain occurs with acidic pH insulin.	Use distraction methods in children.	
Insulin should be at room temperature (A3).	Do not move the needle after insertion.	

14.2 Lipohypertrophy (LH)

Lipohypertrophy is a thick soft to firm swelling with rubbery consistency which appears on the surface of the skin at the site of insulin infections. It is usually due to repeated reuse of needles at the same injection site. It usually appears as raised swelling, which cannot be pinched together. While large LH sites can be seen on inspections, others may be evident only on palpation.

Blanco et al.found that out of 64.4%patients who had LH, 98% either did not rotate sites or rotated incorrectly.

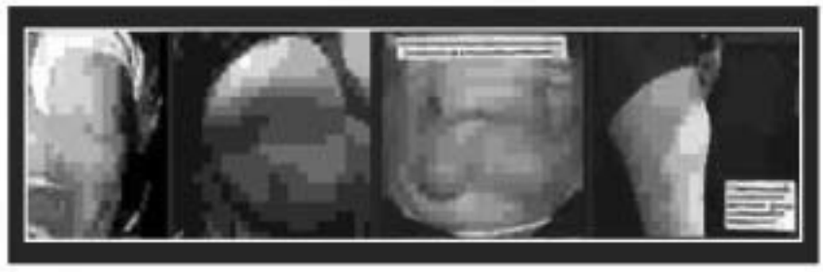

Fig. 10: Lipohypertrophy

Also, 39.1% of patients with LH had unexplained hypoglycemia and 49.1% had glycemic variability. The worldwide ITQ survey indicated that the most common complication of insulin injection was LH; self-reported by 29.0% of patients and found by physical examination in 30.8% by HCPs. Further, it was associated with more frequent episodes of diabetic ketoacidosis, incorrect rotation of injection sites, use of smaller injection zones, longer duration of insulin use, and reuse of pen needles (each $P<.05$). Therefore, non-rotation of injection sites) and single use of needle should be encouraged. Injection in LH reduces insulin absorption, or even causes, erratic absorption leading to high glycemic variability.

.Grassi et al. have shown that targeted individualized training in injection technique, including the switch to a 4 mm needle, is associated with improved glucose control over a three months period, even in patients with LH. Pain sensation gets reduced at LH sites prompting patients

to use this site frequently for injection. This leads to a vicious cycle of significantly unpredictable and delayed absorption causing glycemic variability & unexplained hypoglycemia. Further, unnecessarily larger doses may be used in such cases. Switching site of injections from LH to normal tissue often requires a decrease in dose of insulin but it varies from one individual to another and should be monitored by frequent blood glucose measurements (A1).

14.2.1 Prevention

- Regular inspection and palpation of insulin sites [Self Insulin Site Examination (SelfIE)].
- Single use of needles.
- Does not use the same injection site repeatedly (A2). Follow correct site rotation policy.
- Use larger injection surface areas.

14.2.2 Management

- Do not inject into LH sites.
- Reduce the dose of insulin in habitual LH site injections when shifting to normal SC tissue after consulting physician
- Rule out LH as a cause of poor glycemic control, hypoglycemia and high glycemic variability.
- Injection sites should be inspected and palpated for 136 LH by both HCPs and PWD (A2).

14.3 Bleeding and bruising

Insulin injections can occasionally cause bleeding or bruising but this is usually not significant. Assessment may be needed in case of frequent or excessive bleeding and /or bruising (A2). Studies have shown less frequent bleeding and bruising incidents with the use of shorter needles. Presence of bleed or bruise appears to have no adverse clinical consequences for the absorption of insulin or for overall diabetes management (A2).

Table 23: Tips to prevent bleeding and bruising

• If bruising occurs persistently, injection technique must be reviewed (A2).
• Sites with bleeding and bruising should be avoided until fully recovered (A2).
• To prevent bleeding and bruising, avoid injecting into blood vessels and hair roots (B2).
• Patients are to be assured that bleeding and bruising do not appear to have adverse clinical consequences for the absorption of insulin or for overall diabetes management (A2).
• Do not reuse needles (A2).

14.4 Needle stick injuries (NSI)

NSI are common among HCPs, and warrant training on preventive methods. A cross sectional study found that prevalence of at least one episode of NSI was about 46%, of which 28% occurred within one year prior to the study period and only 24% took prophylaxis for HIV infections. Another study conducted to assess prevalence, causes and prevention of NSI among nurses found syringe needles and crowded wards as main causes of NSI

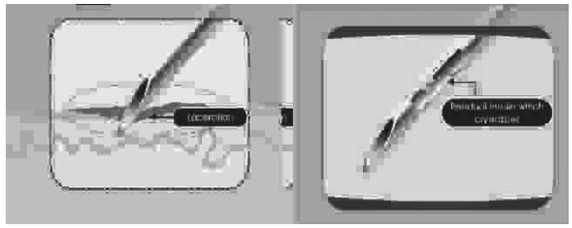

Fig. 11: Risks of needle reuse.

14.4.1 Device and circumstances

Pen needle removal and recapping are critical and dangerous steps because the user's fingers come very close to the exposed tip. In one survey, 57% of patients admitted they unscrew pen needles using their own fingers and 29% of NSI injuries occurred during recapping. Safe medical

instruments and appropriate training on preventive measures are needed to ensure safe practices.

14.4.2 Severity of injury and risk matrix

As NSI and sharps injuries are common among HCPs, continuing risk assessment, risk elimination, training in the use of devices and awareness of the consequences such as injuries is vital. In 2011, Wittmann developed a standardized risk assessment matrix tool for medical sharps. This tool helps to identify the potential risk associated with the devices or procedures, and the appropriate level of sharps safety required.

14.4.3 Prevalence of Blood Borne Infections [Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Human immunodeficiency Virus (HIV)]

The amount of blood regurgitated into cartridges of insulin pens during injection is sufficient to transmit HBV infection. Although insulin cartridges contain antimicrobial agents (i.e.; phenol or cresol), they are only bactericidal and not active against viruses. An epidemiological study conducted in 200 HBcAb+/-anti- HBs T2DM patients compared with well-matched controls (in 1:1 ratio) showed that HBV DNA was detected in 11% of the PWD and in 3% of the controls ($P<0.05$). In several studies, prevalence of hepatitis C infection was found to be higher in PWD than non-diabetics. A cross sectional study conducted in India to determine the sero-prevalence of hepatitis C infection in T2DM, prevalence rate of HCV sero-positivity was found to be 5.7%, with male preponderance. Moreover, a recent meta-analysis that included data from 22 studies also confirmed the same fact with an odds ratio (OR) of 3.50, at 95% CI = 2.54-4.

14.4.4 Prevention and care

14.4.4.1 Single use of needles

This promotes PWD & HCPs/care-givers to discard needle after single use. Re-use involves recapping needles and increases the risk of NSI

14.4.4.2 Education and Training.

HCPs must receive appropriate education and training in how to minimize risk, by following optimal technique and using available safety devices.

14.4.4.3 Shorter needles

Through-through NSI risk is higher with use of longer needle since it may exceed the thickness of folded skin (A2).

14.5 Amyloidosis

Amyloidosis is a rare disorder in which an abnormal protein called amyloid is deposited extra cellularly and impairs tissue function. Clinical studies have shown infrequent local amyloid deposition at the site of 147 repeated insulin injection in PWD. Amyloidosis may be associated with the use of insulin, including human (recombinant) insulin and this may have contributed to the insulin resistance or refractoriness in poorly controlled PWD. The nature of amyloid is considered to be insulin itself or insulin related substance and has been identified as amyloid insulin type (A Ins).Marked improvement in blood glucose has been noticed shortly after resection of the mass or change of the injection site. Hence, to avoid infection, inflammation or mass formation, there is need to educate PWD about regular check-up of injection site and alternate use of insulin injection sites.

14.6 Leakage of Insulin

Leakage from pens can occur due to a poor seal between the needle and the cartridge or incorrect positioning of the plunger (A3). Reflux or backflow out of the injection site can happen when the needle is taken out too soon or in obese patient. The needle length does not have a meaningful influence on the amount of leakage.

14.7 Lipoatrophy

Lipoatrophy (LA) is clinically characterized by visible cutaneous depression and palpable atrophy of subcutaneous fat tissue at the injection site. It is an immunological response to insulin aggregates in the presence of high circulating titres of anti-insulin auto antibodies. LA was more prevalent in the prehuman- insulin era due to the use of animal insulin. However, prevalence of LA has dropped to only 1-2% with the increasing use of purified insulin. In recent years, case reports on LA have increased in the scientific literature indicating that LA may also develop after treatment with recombinant human insulins or insulin analogues.

Fig. 12: Lipoatrophy
Image Courtesy: Dr. Manash Baruah

14.8 Scarring

Scar formation is a consequence of the wound healing process that occurs when body tissues are damaged by a physical injury. Repeated injections into the same subcutaneous tissue and the increasing use of insulin pump therapy carries risks of abscess formation and scarring.

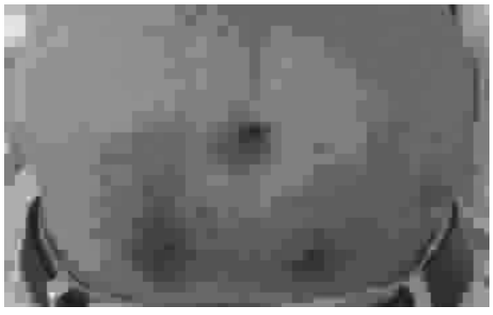

Fig. 13: Scarring
Image Courtesy: Dr. Manash Baruah

15. Injection practices in indoor settings

Each vial or pen should be labeled with the patient's name and bed number/ registration number. To minimize errors, a single strength of insulin should be used in all patients in a hospital as far as possible. Insulin syringes should be stored away from other syringes such as those used for antibiotic sensitivity tests and other purposes.

15.1 Recommendations for both critical and non-critical care settings

- Ensure compatibility of insulin preparations and delivery devices (A2).
- Maintain records of glucose monitoring, insulin dosage, time, and site of insulin (A3).
- Site rotations can be followed by marking sites of insulin injections with ink, with consent of the patient (A2).
- Use needles only once A2.
- Ensure adequate training in insulin technique and disposal to patients and/ or their caregivers before discharge from hospital A2.
- Safe disposal:
  - Place sharps containers in every ICU, ward patient room, and at every nursing station and ensure disposal of in accordance with biomedical waste regulations (A2).
- Audit and appraisal:
  - Audit the ICU and ward insulin policy regularly with help of senior nursing and medical staff (A2).
- Ensure continuing nursing and medical education (A2).

Table 24: Recommendations which differ for the critical and non-critical care settings

Critical Care setting	Non -critical Care setting
• The ICU insulin policy should state the insulin preparation, strength, and delivery device to be used. • Compatibility of insulin strengths and their delivery devices should be ensured. • A fresh syringe should be used to draw each insulin dose if a common insulin vial is used for different patients. • Intravenous insulin is a drug of choice. • Insulin must be administered by HCPs.	• The ward insulin policy should state the responsibilities of nursing and medical staff with respect to insulin prescription, counseling , storage, dose titration , administration, and disposal. • Educate the PWD about the proper storage, compatibility of insulin strengths and their delivery devices. • Insulin syringes and pen needles should not be reused. • Subcutaneous insulin is the drug of choice. • Patients capable of self - injecting should be encouraged to administer their insulin doses.

16. Insulin Pump Therapy/ Continuous Subcutaneous Insulin Infusion (CSII)

An insulin pump is a pager-sized device, which ensures continuous delivery of rapid acting insulin with the help of an infusion set. One end of this set connects to the insulin filled reservoir and is kept inside the insulin pump, and the other end is connected to the subcutaneously placed needle.

Trials conducted across the world have demonstrated that CSII is more beneficial in terms of achieving better metabolic control in T2DM. Unawareness about the multiple benefits of CSII is the main hurdle to its widespread use. In India, CSII is more commonly used in PWD since 2004. Reductions in HbA1c, body weight and total daily dose of insulin are reported in Indian PWD who are on insulin pump therapy (IPT).

A cross-sectional survey conducted among selected Indian PWD who have been on IPT for more than 3 years reported an improvement in QoL after being on pump by 92% patients, the level of satisfaction was rated as ‘fully satisfied’ by 52% of respondents while 26% found being On pump, ‘satisfactory’ 90% thought that the pump met 167 their expectations.

Results of SWEET prospective, multicenter, standardized diabetes patient registry which included 16570 Type 1 diabetes mellitus (T1DM) children reported that relatively good metabolic control was achieved especially in those treated with insulin pumps and in those at younger ages.

16.1 Infusion site

Abdomen is the preferred site for CSII pumps, while the alternate sites are upper arm and thighs.

16.2 Cannula selection

Short length cannulae (6 mm for 90° sets, 13 mm for 30–45° angled infusion sets) are most preferred. Steel needle infusion sets are recommended in pregnancy, for patients who have reactions to plastic cannula and who have frequent kinks with plastic cannula.

16.3 Angle of insertion

The recommended angle of insertion is 90° and 30–45° for dexterous lean or muscular patients and pregnant women.

16.4 Selection of infusion sets

The most popular infusion set is a 90°, soft cannula infusion set. Variable angle, soft cannula infusion sets are also available for patients who are lean or lead an active lifestyle.

16.5 Choice of insulin preparation

The insulins of choice with appropriate stability for use in pumps are RAIAs, as theymimic the endogenous insulin more closely than regular human insulin. Further, the tendency observed for hypoglycemia with RAIAs is significantly less than regular insulin. In comparison to lispro (15.7%) and glulisine (40.9%), Insulin as part (9.2%) led to greatest chemical and physical stability in the insulin pump with the lowest rates of overall occlusion and is thus considered the most compatible of the 3.

RAIAs for pump use. The use of insulin mixture in pump is not recommended as their stability needs evaluation and therefore is not recommended. When injected subcutaneously, insulin as part has a rapid onset and shorter duration of action than soluble insulin.

16.6 Troubleshooting

16.6.1 Adhesive tape allergy

In India, this is rare and use of oral anti histamines for a few days usually suffices.

16.6.2 Infusion site infection prophylaxis

The infusion site must be clean and dry before insertion of the cannula. Changing the infusion set once in every 2–3 days is recommended. In India, most of the pump users retain the same infusion set for 5–7 days due to the high cost of consumables. Customized advice and recommendations are to be made based on afford ability, work pattern, and level of education.

16.6.3 LH

LH has been described in the earlier part of the recommendations.

16.6.4 Loss of insulin potency

The potency of insulin may be compromised if it is used for longer than 3 days or if it is frozen.

16.6.5 Pump occlusion

Cannula and infusion set should be changed if occlusion occurs.

16.6.6 Unexplained hyperglycemia

Emerging data indicates that insulin pump infusion sets are sometimes responsible for unexplained hyperglycemia. This under-reported, and underdiscussedetiology, often leads to a significant psychological burden and, discontinuation of pump therapy and/or diabetic ketoacidosis. Check if hyperglycemia responds to bolus dose and replace infusion set immediately.

16.7 Recommendations

- To minimize infusion site adverse events and potential metabolic deterioration, CSII cannula should be changed every 48 to 72 hours (A1).
- Patients should be taught to rotate infusion site (A1).

17. Injection device disposal

Responsibility of environmental-friendly and safe disposal of insulin sharps has to be shared by all stake--holders including prescriber, consumer to waste disposer and recycler. HCPs should shoulder responsibility of awareness and sensitization regarding safe disposal. A study from

New Delhi has showed that 84.1% PWD discarded the sharps directly into their household waste bins. Recent worldwide ITQ survey including 7.6% patients from India found that a very large number of used diabetes sharps still end up in the general community trash. 8.6% of the total population agreed to sharps injuries in community because of wrong disposal practices.

Lack of knowledge about proper method of disposal, lack of counseling by HCPs and fear of revelation of diabetes status are major factors that compromise safe disposal of insulin delivery sharps in India.

Fig. 14 : Safe disposal of injection devices.

17.1 Learning from other country practices and guidelines

A review of 12 community based program from United States, Canada, and Australia for syringe disposal among PWD showed that drop boxes, puncture proof containers disposed in the trash and sharps container disposal at designated sites were the preferred practices. The harm reduction strategy propagated by NACO has issued guidelines for disposal of waste needles and syringes. Green diabetology campaign has propagated practices regarding proper waste disposal. This can help to prevent the adverse impact of diabetes waste on environment.

17.2 Recommendations

- Collect the used needles or syringes in puncture proof box/ safety box/ strong cardboard/glass container.
- Label the box as biohazard and hand it over to nearby healthcare facility.
- Proper education and training about the safe disposal of the sharps to PWD (A3).
- Adopt simple strategies depending upon sociodemographic, economic, and cultural practices inherent to the area.

Table 25: Safe disposal of injection devices

• Awareness of local regulations should be created among patients and healthcare professionals. Legal and societal consequences of non-adherence should be reviewed (A3).
• Patients should be educated about correct disposal right from injection initiation and this should be reinforced throughout the therapy (A3).
• The patient's family members, especially children, and service professionals (rubbish collectors and cleaners) should be made aware of potential risks (A3).
• Sharp materials should never be disposed off in public trash bins or areas (A3).
• Empty pen devices can be disposed in household refuse bins (B2).

18. Disaster management

Avoiding or missing insulin therapy in persons with T1DM can be life threatening. Hence, patient's education about the disaster management is important (A2). A portable, insulated, and waterproof diabetes disaster kit should be A3 kept handy.

The kit should have a supply of insulin syringes for at least 30 days and insulin vials or pens and needles along with cold packs (A2). In addition, it should also contain blood testing supplies including lancets, test strips, and a glucose meter (preferably two) with extra batteries. A separate sharps container for the disposal of lancets and needles should also be included.

At least a 3 day supply of nonperishable food and bottled water is also recommended.

19. Health education interventions

Initiatives to enhance diabetes education in patients and caregivers can improve self-care behaviors, knowledge and attitude domains profoundly. Linetzky et al. 2016 in a long term multi-center education trial showed that combined education of patients and physicians provided the significant and sustained clinical and metabolic improvement in the intervention group than in the control group.

Table 26: Disaster management: Recommendations

- Patients should be educated about the importance of disaster management (A2).
- Supplies adequate for 30 days should be kept ready in the disaster kit (A2).
- The disaster kit should be personalized for each patient (B3).
- The disaster kit should be kept in a handy spot, ready to go (A3).

Table 27: Therapeutic education

- Before starting the injection therapy, the healthcare provider should ensure that patients understand each of these essential topics (A3).
  - The injection regimen
  - The choice and management of the devices used
  - The choice, care and self-examination of the devices used
  - Proper injection techniques (including site rotation, injection angle and possible use of skin-folds)
  - Injection complications and how to avoid them
  - Optimal needle lengths
  - Safe disposal of used sharps
- Healthcare professionals should spend ample time exploring patient anxieties and other concerns about the injecting process and insulin itself (A3).
- A quality management process should be put in place and made sure that the correct injection technique has been practiced regularly by patients and is also documented in the record (A3).

19.1 Assessing Outcome

When educating in a group setting, there is evidence that better adherence and lower subsequent HbA1c values are achieved if the HCPs has formal training as an educator.

Patient Education on insulin technique can:

- Reduce the risk of complications significantly.
- Support well being and satisfaction of the patient.
- Support target Hb1Ac while minimizing need for additional insulin.

19.2 Periodic clinical audits

A periodic audit of injection practices in PWD by their clinicians is highly recommended (A3). Mutual audits can be performed in pairs by members of diabetes clubs or patient organizations.

Table 28: Recommendations for periodic clinical audits

- Periodic clinical audits should be performed to ensure that administration of injections is according to the prescribers' instructions (A2).
- Nurses and other HCPs should be aware of the actions, contraindications and side-effects of the drug (A2).

19.3 Measures to improve adherence to insulin injection therapy

Encouraging patients to ask questions and clarify doubts is important. Arranging periodic refresher sessions with patients is helpful in addressing any new issues that arise during the course of therapy. The message should be personalized,

and information relevant to the patient's perspective should be provided. The use of pens makes insulin injections more convenient and promote better adherence to schedule and increases patient compliance.

The WATER approach explained below has been suggested to fulfill the purpose. The patient must be Welcomed Warmly in the clinic, from the outpatient counter onwards. The clinicians should ask and Assess carefully making use of various cues and sequencing the questions appropriately. They should tell truthfully making use of metaphors analogies, keeping in mind both verbal, as well as nonverbal cues from the patient. They should explain with empathy, making use of experience sharing, practical demonstration, and imparting coping skills training. Finally, the clinicians must reassure the patient and tell him/her to return for any clarifications.

Table 29: WATER approach

• Welcome warmly
• Ask and assess
• tell Truth fully
• Explain with Empathy
• provide Reassurance

20. Seven Golden Rules

Table 30: Golden rules for injection technique

1.	The injection site should be clean, as should one's hands (A2).
2.	4mm pen needles, and 6 mm syringe needles are recommended for all adults, children and adolescents. Children < 6 years of age, and very thin adults may inject perpendicularly into raised skin folds (A2).
3.	Recommended sites are the abdomen, upper, thighs, upper arms and upper buttock (A2).
4.	Persons using insulin should self-inspect their injection sites and screen for LH (SelfIE) (A3).
5.	Injection sites should be inspected and palpated by diabetes care professionals at least once a year, and more frequently if LH is detected (A2).
6.	Needles should not be reused. Insulin pens, cartridges and vials should not be shared (A1)
7.	7 Safe disposal of insulin needles and ancillaries should be ensured (A2).

21. Conclusion

FITTER, India 2017recommendations provide new, evidence-based, practical, and comprehensive set of recommendations for patients and professionals. The tools, approaches, and practices described here will help in adoption of correct injection technique and safe use of anti-diabetic injectable therapies.

22. Duality of Interest

The authors are members of FIT India advisory board, who have helped develop the Indian Insulin Injection Technique Recommendations 2017. FIT India is supported by Becton Dickinson India Private Limited (BD), a manufacturer of injecting devices. Members of the FIT advisory boards have not received any honorarium from BD for their contribution to the recommendations. FIT India is constituted to provide evidence based information on best practices on injection technique, to all those using injectable therapies for diabetes care, in order to achieve best possible health outcomes, ensuring that the right dose is delivered at the right injection site, using the right technique, each time.

For further reference:

Visit fitter4diabetes.com/pages/recommendations

QUESTION AND ANSWERS

Q) What form of physical activity might be good for you if you have diabetes related foot problems?

A) 50% of diabetic patients suffer from peripheral neuropathy which is one of the serious complications of diabetes, and is the most common form of neuropathy. In peripheral neuropathy, patient experience burning, stabbing, pain , tingling sensation, loss of sensation , balance and walking inability. Neuropathy leads to muscle weakness, foot ulceration and falls, painless and numb feet. There is a nerve fibre loss which is caused by metabolic and vascular factors. By following a regular exercise routine these patients can combat and can even prevent diabetic peripheral neuropathy. Aerobic exercises such as running, swimming, strength training exercise have shown improvements like decreasing pain and increasing function and nerve conduction. Exercise contributes to improved glucose control which slows the progression of diabetic neuropathy.

Patients should seek advice and instruction from a qualified professional when beginning an exercise program. This is very important for patients with neuropathy as they are at risk of fall. For these patients flexibility training or other modes of exercise that promote balance training such as yoga should be practiced to help reduce the risk of fall.

Aerobic exercise should be performed at least three days a week at a moderate to vigorous intensity corresponding to 40%-60% of maximum oxygen consumption. The intensity of exercise is more important in constructing an exercise program. Exercise involving a large muscle group cause elevation in heart rate and should be encouraged.

Resistance training should be performed in conjunction with aerobic training at least 2 days a week at a moderate to vigorous intensity. At least 5 to 10 exercises involving major muscle groups should be done in each session, with 3 or 4 sets of 10 to 15 repetition performed per exercise.

The American Diabetes Association recommends that people with diabetes related peripheral neuropathy should limit the amount of weight bearing exercises due to their increased risk of foot ulcers and amputations.

DIVYA JAIN

Q) What are the chronic complications of Diabetes?

A) MACROVASCULAR COMPLICATIONS

1) Coronary artery disease

Due to high levels of LDL, VLDL, TG, and low levels of HDL there is atherosclerosis which leads to a reduction of blood supply to the heart which is called as ischemic heart disease. There is glycation of proteins which alters the physical characteristic of lipoprotein molecules. Glycated LDL binds with the endothelial cells, leading to lipid deposition. Glycation of the basement membrane and deposition of polysaccharide derivatives lead to the trapping of LDL due to which HDL cannot scavenge LDL.

Excessive lipid deposition causes AOVD (atherosclerotic occlusive vascular disease). Glucose intolerance and hyperglycemia activates plasminogen activators which causes increased plasma fibrinogen, increased blood viscosity, increased platelet aggregation (due to insulin like growth factors- somatomedin-c). Platelet derived growth factor, growth hormone and insulin causes smooth muscle cell hyperplasia which plays a key role in arthrosclerosis.

Hypertension and Diabetes

Hyperinsulinemia and insulin resistance alters lipid metabolism. Insulin resistance causes reabsorption of Na (renal tubular reabsorption) as a result there is decreased Na excretion. Insulin stimulates SNS activity; hypertension is due to renal constriction, rennin- angiotensin aldosterone system activation and increased renal tubular reabsorption of sodium.Due to the artherosclerotic process, there is gradual reduction of blood supply to the heart muscles, damage to the heart muscle, by

making it weak to contract and to pump adequate amount of blood leading to flabby and dilated muscles with resultant backlog of the delivered blood, leading to breathlessness.

2) Cerebro-vascular disease

Involves arterial or venous system of the brain, which impairs perfusion to any part for a transient or prolonged period of time leading to stroke. The change in the cerebral vessels , can be either congenital or acquired factors, which may be intrinsic to the vessel wall, as a result of artherosclerosis of the blood vessels, consequent to changes in the constituents or viscosity of the blood, formation of clot originating at a distant site and carried through circulation.

3) Peripheral vascular disease

Atherosclerosis of the blood vessels supplying blood to lower extremities and / or cardiomyopathy causes decreased blood supply to the peripheries of the body, specially the lower extremities, i.e. lower limb and foot. There is an increased risk of foot infections with delayed wound healing. This stage is commonly referred to as DIABETIC FOOT or GANGRENE.

B) MICROVASCULAR COMPLICATIONS

1) Retinopathy

Can lead to blindness. The development and progression, depends on duration and high glycemic levels.

It is of 3 types.

a) Non- proliferative- Characterized by Microaneurysms, i.e. pouch like dilation of terminal capillaries.

b) Pre- proliferative -Lesions of soft exudates and formation of new blood vessels on retina due to increased requirement of oxygen and other nutrients to retina.

c) Proliferative- Final and vision threatening stage. Neo- vascularisation of retina can be deep and reach the macula. Macular edema causes thickening of central portion of retina leading to glaucoma, increased intra-ocular pressure which leads to increased internal hemorrhages.

2) Nephropathy

Progression:

a) There is increased albumin excretion and reduced GFR.

b) Microalbuminuria - There is increased albumin excretion (30-300 mg/d), without any or little change in the GFR. This is a reversible stage.

c) Macroalbuminuria- There is increased albumin excretion (>300mg/d), decreased GFR and increased BP= >140/90, this is an irreversible stage.

d) Overt Nephropathy: Dialysis is required if the GFR = <20ml/min.

Factors influencing nephropathy: blood glucose control, control over BP, anti hypertensive therapy (ACE inhibitors) causes decreased proteinuria which leads to decreased nephropathy. Increased physical activity, smoking cessation and decreased protein intake (0.8g/kg body wt) and Na consumption (<2000mg/d) are beneficial.

3) Neuropathy

It is characterized by nerve damage, seen in both type 1 and 2 diabetes. It is of 2 types.

a) Peripheral neuropathy - Affects the nerves controlling hands and feet. Nerve dysfunction is caused by ischemic vascular disease and biochemical changes in nerve and structural changes in schwan cells. Axonal degeneration causes irreversible damage while demyelination is usually reversible.

b) Autonomic neuropathy- Affects nerves controlling different organ systems. Decreased response to cardiac nerve impulse can lead to painless or silent ischemic heart disease. Sexual dysfunction can occur with autonomic neuropathy.

c) GI system: Can lead to oesophagitis, nausea, decrease gastric emptying, loss of nutrients due to diarrhea and constipation. Gastro-paresis leads to decreased gastric motility causing vomiting, diarrhea, bloating, and feeling of fullness and erratic blood glucose levels.

DIVYA JAIN

WHAT'S COOKING?

TOFU PITTA POCKETS

Ingredients :

Ingredients	Amount
Tofu	80gm
Whole wheat flour	1/4 cup(40gms)
Tomato puree	2 tbsp (20gm)
Grated onion	1/4 cup(40gm)
Soya sauce	1 tbsp
Capsicum (finely chopped)	1 tsp (5 gm)
Carrot (grated)	1 tsp(5gm)
Oil	2 tsp(10ml)
Whole wheat bun	2 tsp
Lettuce leaves	2
Tomato	1/2 (20gm)
Onion	1/2 (20gm)
Salt	To taste

Method of preparation:

1) Chop the tofu into very small pieces. Add 1/2 tbsp of wheat flour, soya sauce, tomato puree and grated onion, capsicum, carrot and salt to the tofu and mix properly.
2) Make a round patty of the mixture and then grill the patty by brushing some oil on the griller. Grill at low temperature for 4-5 minutes.
3) Cut the bun into 2 halves and arrange the lettuce leaves, tomato, onion, slices and divide the patty into 2 portions and place on each half. Close the bun and serve.

Serves: 1

Nutritive value for 1 serving

Energy (kcals)	Carbohydrates (gm)	Protein (gm)	Fats (gm)	GI
310	32	20.5	10	Medium

VEGETABLE SALAD

Ingredients :

Ingredients	Amount
Broccoli	50g
Avocado	50g
Red cabbage	10g
Spinach leaves	10
Carrot	1/2 (10 gm)
French beans	20g
Peas	20g
Baby corn	2 (15 gm)
Olive oil	2 tsp
Salt	To taste
Black pepper powder	1/8 tsp
Oregano	1/2 tsp

Method of preparation:

1) Wash all the vegetables properly.
2) Chop all vegetables into bigger pieces.
3) Cook oil in a pan add all vegetables except spinach leaves, cook for 2-3 minutes by covering the lid.
4) Then add the spinach leaves and cook for 2 minutes and add the salt, pepper, and oregano and mix properly. Switch off the flame. Do not cook the vegetables completely.

Serves: 1

Nutritive value for 1 serving

Energy (kcals)	Carbohydrates (gm)	Protein (gm)	Fats (gm)	GI
153	10	5	10	Low

HOW KNOWLEDGEABLE ARE YOU?

1) Lack of vitamin B may result in:
   a) Poor eye sight
   b) Dull skin
   c) Tooth decay
   d) Poor cellular respiration

2) Adipose tissue inflammation in obese subjects is characterized by all of the following except:
   a) Accumulation of macrophages
   b) Accumulation of lymphocytes
   c) Elevated free fatty acids in serum
   d) Elevated leptin concentrations
   e) Elevated adiponectin concentrations

3) Over what period does an HbA1c measurement reflect the glucose control?
   a) The previous 24 hours
   b) The previous 7 days
   c) The previous 30 days
   d) The previous 8-12 weeks

4) Hyperinsulinemia may be caused by all of the following except:
   a) An insulinoma
   b) Nesidioblastosis
   c) Insulin resistance
   d) Type 1 diabetes

5) Insulin is stable at what temperature?
   a) 30°C
   b) 25°C
   c) 35°C
   d) <20°C

6) What is the normal level of LDL cholesterol for diabetics by NCEP?
   a) 150-200 mg/dl
   b) <200 mg/dl
   c) <100 mg/dl
   d) 130-220 mg/dl

7) Which food is likely to give a poor response in hypoglycemia?
   a) Glucose tablet
   b) Cane sugar
   c) Regular chocolate
   d) Fruit juice

8) Charcot neuro arthropathy mainly involves
   a) Foot & Ankle
   b) Knee & Ankle
   c) Wrist & Hand
   d) None of the above

9) Nutrient-dense foods can be defined as:
   a) Foods that contain good sources of nutrients and are low in Calories.
   b) Foods that contain low amounts of nutrients and are high in Calories.
   c) Foods that contain good sources of nutrients and are high in Calories.
   d) Foods that contain low amounts of nutrients and are low in Calories.

10) The following thyroid disease is a common accompaniment of type 1 diabetes
   a) Hashimoto's thyroditis
   b) Viral thyroditis
   c) Multi nodular goiter
   d) Thyroid adenoma

ANSWERS:

1) d) 2) e) 3) d)
4) d) 5) b) 6) c)
7) c) 8) a) 9) a)
10) a)

MEMBERSHIP FORM

Association of Diabetes Educators (ADE)

(For eligibility criteria: Check Website www.diabeteseducatorsindia.com)

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₹ 1000/- is payable in cash / cheque / draft with the application form

Add ₹ 100/- for outstation cheques

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BOOK REVIEW

RSSDI text book of Diabetes Mellitus; Editor-in-Chief: H B Chandalia, Executive Editor: G R Sridhar, Editors: A K Das, S V Madhu, V Mohan, P V Rao

Jaypee Brothers Medical Publishers; New Delhi; 2014; pages 1457; Price Rs 2995

The third edition of RSSDI Text Book of Diabetes Mellitus (D M) has been published six years after the second edition. It is authored and edited by those clinicians and professors who have been teaching and practising diabetes over many years within the country. A few chapters are contributed by Non-resident Indians. As pointed out by the editor-in-chief, this edition has undergone considerable revision. The material published both within the country and outside till the end of 2013 has been critically analysed and included. A few topics which are paid scant attention in other books, like-the complexity of insulin resistance, the criteria applicable to metabolic syndrome in Asians,challenges in the management of children and elderly with diabetes,musculoskeletal manifestation of diabetes, malnutrition modulated diabetes, Latent Autoimmune Diabetes in Adults (LADA), neonatal diabetes and the role of Yoga and relaxation techniques are unique to this book.

The flow chart on the management of diabetic ketoacidosis available in this book should be in possession of all ICUs. The colour pictures of retinopathy, foot lesions, skin diseases and musculoskeletal manifestation are well presented. The role of alternate therapy is extensively discussed. The guidelines for the beginner to organise a diabetic clinic and optimal health care for diabetes amidst diversity of social, economic and regional food habits is noteworthy. The limitation of stem cell therapy as of now is a good reminder. Some controversial issues are discussed in individual chapters. Much alike the chapter on A Glimpse in the Future, I wish a full chapter was devoted to controversies in diabetes. New chapters added in this edition are valuable and discuss important current issues. These include Sleep and Type 2 diabetes-mellitus, Early-onset Type 2 DM, Nutrient blockers and Bromocriptine, Insulin Pump Therapy, Glycemic Management in Hospitalized Patients, Continuous Glucose Monitoring System, Vitamin D and DM, HIV in Diabetes, Diabetes and Cancer.

The appendix is retained from the previous edition and gives a wealth of information applicable to Indian subjects like BMI and waist circumference and laboratory values in S I and conventional units.The index has attained perfection.The novel feature of this edition is mentioning the chapter number on the right edge of each page.

The book will prove to be valuable to students, physicians, diabetologists, endocrinologists and providers of diabetes care. It should be on the shelf of every medical library. The availability of this book has made the Western text books redundant. The single volume covering so many topics is bulky and heavy. I wish it was brought out in two volumes.

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