

## **DIABETIC NEUROPATHY – A SHORT REVIEW**

Diabetic neuropathy is a serious diabetes complication that may affect as many as 50% of people with diabetes. But it can be prevented or its progress slows with consistent blood sugar management and a healthy lifestyle. It can be peripheral (DPN) or central (cranial).

### **Symptoms**

There are four main types of diabetic neuropathy. A patient can have one type or more than one type of neuropathy.

Symptoms will depend on the type and which nerves are affected. Usually, symptoms develop gradually. Problem is nothing wrong can be noticed until considerable nerve damage has occurred.

### **Positive vs negative symptoms**

Positive symptoms mean that the nerves are in the process of damage and causes pain, allodynia, hyperalgesia, paraesthesia etc.

Once the nerves are (both myelin and axons are damaged) negative symptoms develop like numbness, hypoelgesia and then even control of diabetes cannot reverse them.

It is to be noted that like most metabolic causes, diabetic neuropathy is also more of axonal type damage.

### **Signs**

- Loss of muscle power
- Checking of muscle bulk (actually measuring them)

- Loss of all sensory modalities (not all in all patients, and can vary from patient to patient)
- Absence or reduced jerks
- Clinical checking of nerve thickening to find other causes
- A good systemic examination to check for associated causes of neuropathy along with or separately with Diabetic neuropathy.

## PATHOPHYSIOLOGY

The pathophysiology of diabetic peripheral neuropathy is **multifactorial** and is thought to result of the following:

- Vascular disease occluding the vasa nervorum
- Endothelial dysfunction; deficiency of myoinositol-altering myelin synthesis  
Diminishing Sodium-potassium adenine triphosphatase (ATPase) activity
- Distal Axonopathy: In this form of neuropathy, a metabolic abnormality causes failure of protein synthesis and axonal transport, resulting in degeneration of distal regions of axons.
- For this reason, **axonal neuropathies** characteristically produce a "stocking-glove" distribution of numbness and weakness.

## TYPES OF NEUROPATHY

### 1] Peripheral neuropathy

This type of neuropathy may also be called distal **symmetric or asymmetric and even intercostal** peripheral neuropathy. It's the most common type of diabetic neuropathy. It affects the feet and legs first, followed by the hands and arms (distal to proximal, as longer

nerves are usually involved first. However, this is not the rule and some patients can present the other way round.

Signs and symptoms of peripheral neuropathy are often worse at night, and may include:

- Numbness or reduced ability to feel pain or temperature changes
- Tingling or burning sensation
- Sharp pains or cramps
- Increased sensitivity to touch — for some people, even a bedsheet's weight can be painful. With neuropathic pain, the nerve fibres themselves may be damaged, dysfunctional or injured.

Neuropathic pain is the result of disease or injury to the peripheral or central nervous system and the lesion may occur at any point. These damaged nerve fibres send incorrect signals to other pain centres.

- Serious foot problems, such as ulcers, infections, and bone and joint pain

## **2] Autonomic neuropathy**

The autonomic nervous system controls the rate/rhythm of heart, bladder control, stomach (gastroparesis leading to vomiting or bloating, nocturnal diarrhoea, intestines – unexplained colic (patients have gone through unnecessary surgeries too) , sex organs (erectile or ejaculatory disturbances) and eyes( cranial nerve paresis commonly 3<sup>rd</sup>.6<sup>th</sup> and 7<sup>th</sup>. The outcomes can be as follows:

Also Diabetes can affect autonomic nerves in, possibly causing:

- A lack of awareness that blood sugar levels are low (hypoglycaemia unawareness)

- Bladder or bowel problems
- Slow stomach emptying (gastroparesis), causing nausea, vomiting and loss of appetite and at times severe stomach pain
- Changes in the way your eyes adjust from light to dark
- Decreased sexual response

### **3] Proximal neuropathy (diabetic polyradiculopathy)**

This type of neuropathy — also called *diabetic amyotrophy* — often affects nerves in the thighs, hips, buttocks or legs. It can also affect the abdominal and chest area. Symptoms are usually on one side of the body, but may spread to the other side.

Another similar entity is Diabetic polyradiculitis which can be picked up (enhancement of roots seen) with using contrast during MRI study of L-S spine. Patient may have:

- Severe pain in a hip and thigh or buttock –commonly misdiagnosed as radiculopathy.
- Eventual weak and shrinking thigh muscles
- Difficulty rising from a sitting position (proximal weakness)

### **4] Mononeuropathy (focal neuropathy)**

There are two types of mononeuropathy — cranial and peripheral.

Mononeuropathy refers to damage to a specific nerve. Mononeuropathy may also lead to:

- Difficulty focusing or double vision
- Aching behind one eye
- Paralysis on one side of your face (Bell's palsy)
- Numbness or tingling in your hand or fingers, except your pinkie (little finger)

- Weakness in your hand that may cause you to drop (commonly the median nerve gets involved a condition called - Carpal tunnel syndrome)

### **Checking for diabetic neuropathy**

The American Diabetes Association recommends that screening for diabetic neuropathy should begin immediately after someone is diagnosed with type 2 diabetes, and five years after diagnosis for someone with type 1 diabetes. After that, screening is recommended annually. This will help in early detection and the progression can be restricted by good glycaemic control. The same concept which holds for retinopathy and nephropathy.

### COMPLICATIONS

- Nerve damage or diabetic peripheral neuropathy is one of the long-term complication of diabetes.
- If left untreated, the damage caused by neuropathy can **potentially lead to infection and limb amputation.**
- Diabetic foot.

### **Signs of Diabetic Foot Problems**

- Changes in skin colour.
- Changes in skin temperature.
- Swelling in the foot or ankle.
- Pain in the legs.
- Open sores on the feet that are slow to heal or are draining.
- Ingrown toenails or toenails infected with fungus.
- Corns or calluses.

- Dry cracks in the skin, especially around the heel.

## **TREATMENT**

There is as such no treatment to reverse the DPN. The hallmark is to control a good glycaemic status and that is best tested by watching on HbA1C.

However, for those with gross symptoms, either positive or negative the treatment can be divided into pharmacological and non-pharmacological.

### 1] PHARMACOLOGICAL TREATMENT

According to guidelines from the American Academy of Neurology, the most effective medications for treating painful diabetic neuropathy (PDN) include:

- Pregabalin
- Gabapentin
- Duloxetine
- Venlafaxine or Desvenlafaxin (SNRI)
- Amitriptyline.
- Carbamazepine

### 2] NON-PHARMALOGICAL

- Increasing physical activity
- Physiotherapy for balance and gait training for those who have significant proprioceptive damage.

- Footwear care – there have been specially devised shoes where patients can get a feel of walking wearing them or else walking bare footed, they, due to negative symptoms as numbness cannot sense the ground and can injure their feet.
- **aerobic exercise may** also improve blood vessel health in those dealing with diabetes-related neuropathy.
- **B vitamins** for neuropathy. B vitamins are useful in treating neuropathy since they support healthy nervous system function. Peripheral neuropathy is sometimes caused by a vitamin B deficiency. Supplementation should include vitamin B-1 (thiamine and benfothiamine), B-6, and B-12.
- If B-12 deficiency isn't treated in a timely manner, **the nerve damage can be permanent**. The best food sources of vitamin B-12 are meats, fish, eggs, low-fat dairy foods and fortified cereals.
- Neuro-stimulators for chronic debilitating pain developed by Medtronic, Abbott and Boston Scientific use much lower frequencies, typically well under 200 pulses-per-second, to help extend their battery life for years. However, these rates can also produce a tingling or buzzing sensation during therapy, known as paraesthesia.

## PITFALLS

Diabetics can also develop neuropathies due to other causes than diabetes. Sudden changes in existing symptoms or rapid sudden progression needs proper clinical evaluation and treatment according to the cause.

Certain diseases which can overlap Diabetic neuropathy are:

- Praneoplastic neuropathies – Multiple myeloma –performing a serum protein electrophoresis

- AIDP – NCV repeat testing and Lumbar puncture
- Metabolic causes –Estimation of other vitamins
- Excessive (binge drinking) Ethanolism –Sudden rise in GGT in LFT or rise in Arterial Ammonia.
- Immunological – Diabetes itself can be considered an immunological disorder, so a patient suddenly deteriorating should be clinically assessed as a case of rheumatology and relevant studies with an initial baseline rising CRP or changed banding pattern in an ANA testing to find other immune markers should be concentrated.

## **SUMMARY**

In conclusion it can be said that the so very common disease Diabetes mellitus can lead to triopathies (retinopathy, nephropathy and neuropathy). A regular stringent glycaemic control is necessary. It is an accepted fact that the first 5-year control of diabetes, if stringent can reduce the complications of Diabetes both related to macro vascular and microvascular pathologies.

The patterns of neuropathies should be identified and the patient given options for both pharmacological & non pharmacological treatments.

Finally, one should not be complacent about his diabetic neuropathy patient but observe for new symptoms and signs to find other co-existing causes of neuropathy.



## FIGURES

### Red flags



1] Early cellulitis in a neuropathic patient



2] Early changes of an evolving diabetic foot

### Examination



Checking jerks



Checking loss of muscle bulk and power



Checking loss of sensation