ETIOPATHOGENESIS
&
PATHOLOGY OF LEPROSY

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Learning Objectives

- At the end of the session, you will be able to:

1. Describe the aetiopathogenesis of leprosy

2. Discuss the effect of immunological response of host on presentation of the disease.

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Recap from Epidemiology

- Leprosy is a chronic infectious disease caused by Mycobacterium leprae
- Mainly affects skin & nerves
- More important – may produce disability, the main cause of stigma
- Bacteria enter & exit the body through upper respiratory tract
- Incubation period is long & variable

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Pathogenesis of Leprosy

- Onset – insidious
- Usually affects skin & nerves – affinity for cooler parts of the body
- But can affect any part of the body except central Nervous System
- Low pathogenicity - only a small proportion of infected people develop the disease

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Pathogenesis of Leprosy

- Bacilli enter the body usually through respiratory system
- After entering the body, bacilli migrate towards the neural tissue and enter Schwann cells.
- Can also be found in macrophages, muscle cells and endothelial cells of blood vessels.
- Slow multiplication inside cells & tissues with lower temperature (about 12 – 14 days for one bacterium to divide into two)
- Further progress depends on the immunological status of the infected person

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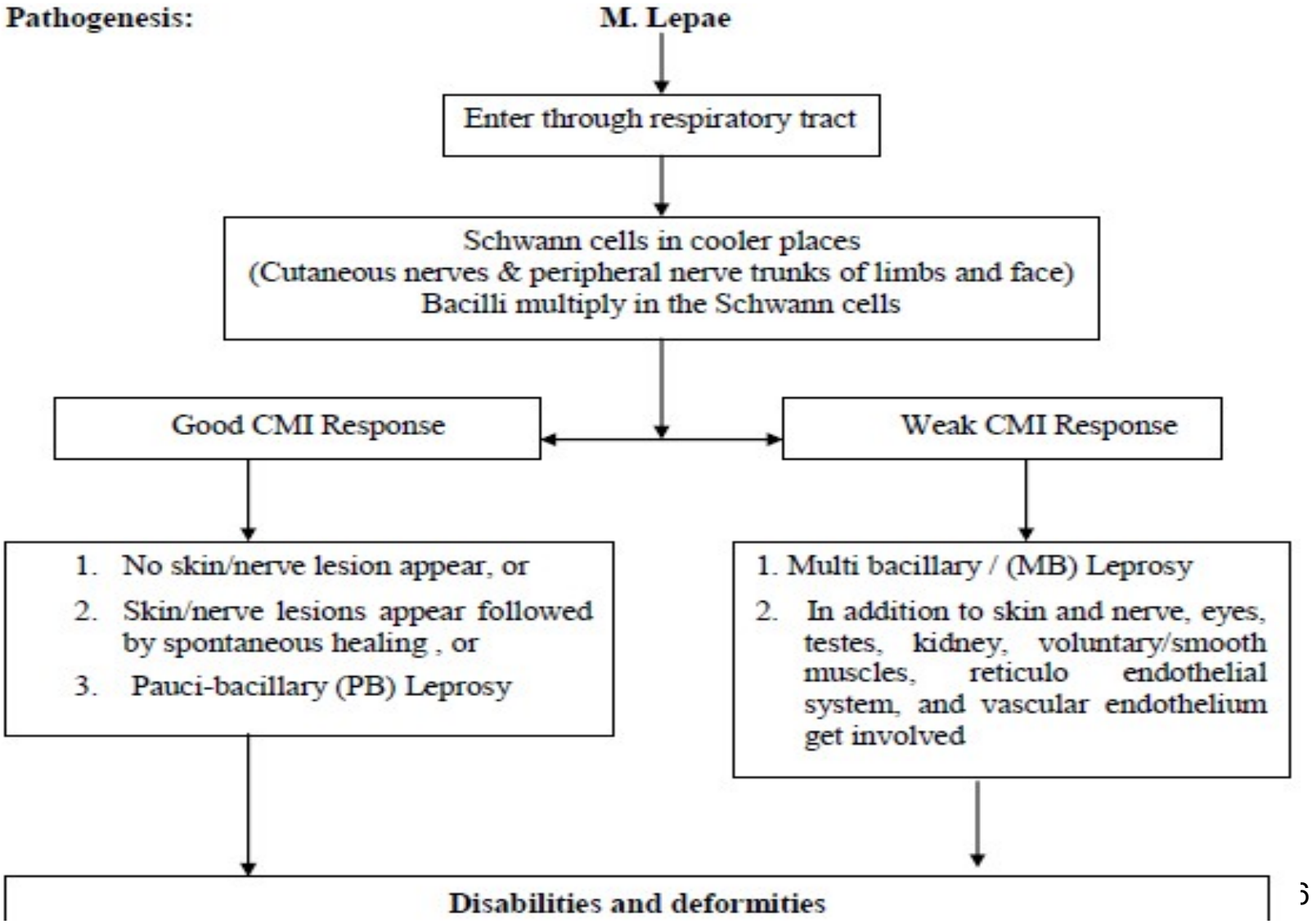
Pathogenesis of Leprosy



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Effect of strong cell mediated immunity

- Granuloma formation in cutaneous nerve
- Inflammation within the epineurium causes compression and destruction of unmyelinated sensory and autonomic fibers.
- Myelinated motor fibers are the last to get affected producing motor impairment.
- Severe inflammation may result in caseous necrosis within the nerve.
- Sensory loss – 30% of sensory fibers are destroyed
- M. leprae may escape from nerve to adjacent skin at any time and cause **classical skin lesion(s)**

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Effect of depressed Cell Mediated Immunity

- Bacilli multiply unchecked in schwann cells and destroy the nerve.
- Bacilli liberated by infected and destroyed cells are engulfed by histiocytes
- Wandering macrophages - travel to other tissues, through blood, lymph or tissue fluid.

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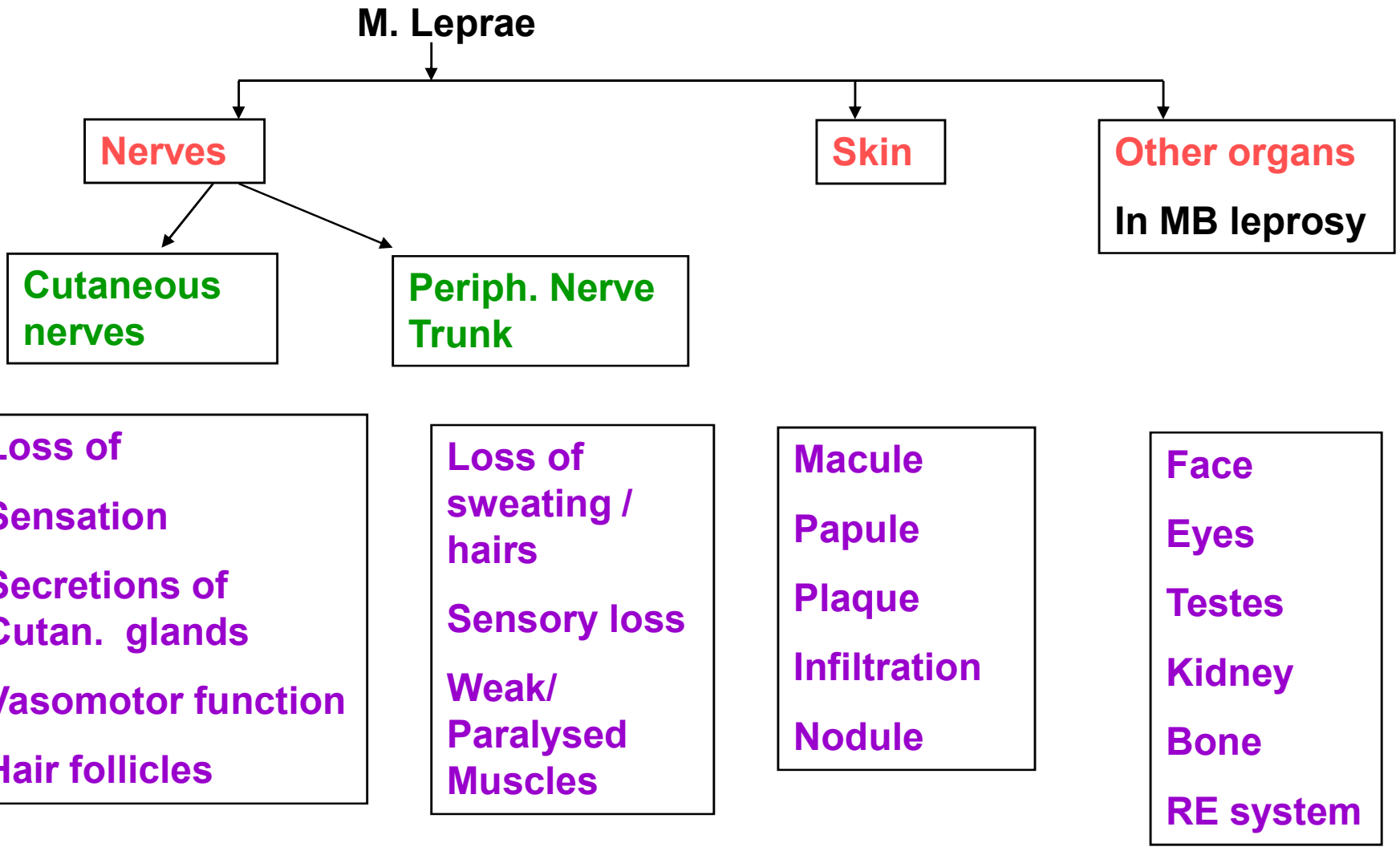
Pathogenesis



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Pathogenesis: Skin Lesions

- Anywhere on the body
- Macule/ Patch/ Papule/ nodules
- One/ Few/ Many
- Small / Large
- Hypo- pigmented / erythematous / pale / coppery
- ill defined / well defined margins
- Reduced /loss of sensation
- Surface - Dry/ wrinkled / granular to shiny, soft
- Sweating +/-
- Hairs – sparse/ fragile / absent
- Nodules – face & ears
- Diffuse infiltrative lesions

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Mucous membrane

- **Nasal mucosa**
  - Nasal congestion
  - Anosmia
  - Perforation of nasal setum
  - Saddle nose deformity
- **Papules may appear on lips, tongue, palate and larynx leading to ulceration.**

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Exclude Leprosy if, skin lesion is:-

1. Present since birth
2. De-pigmented / has de-pigmented hairs
3. Itching is present
4. Removable scaly/flakes present except in resolving reversal reaction
5. Show any seasonal variation

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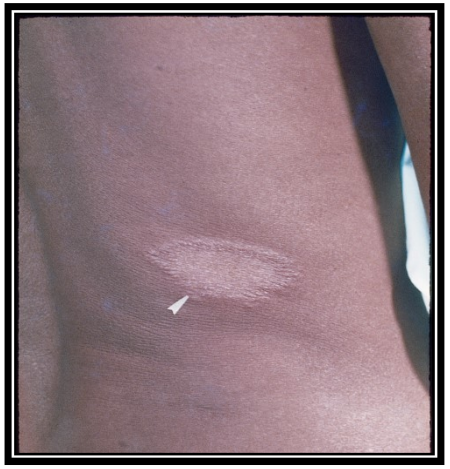
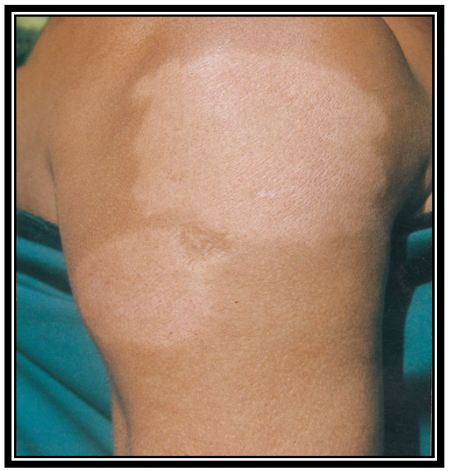
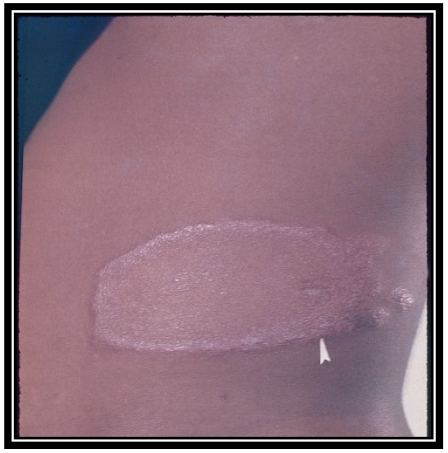
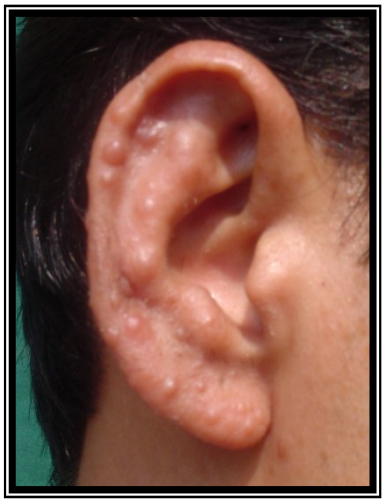
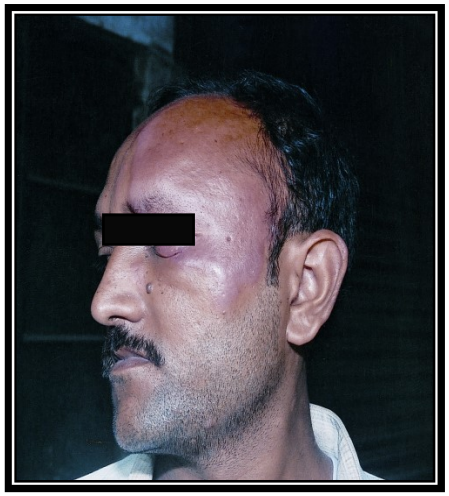
Skin lesions:

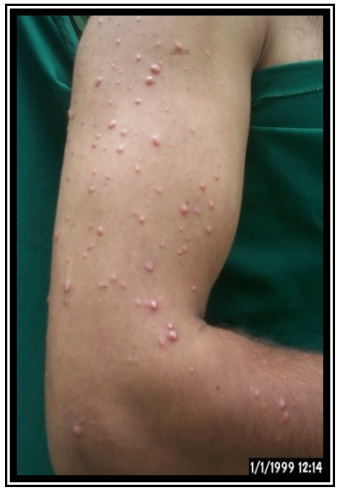












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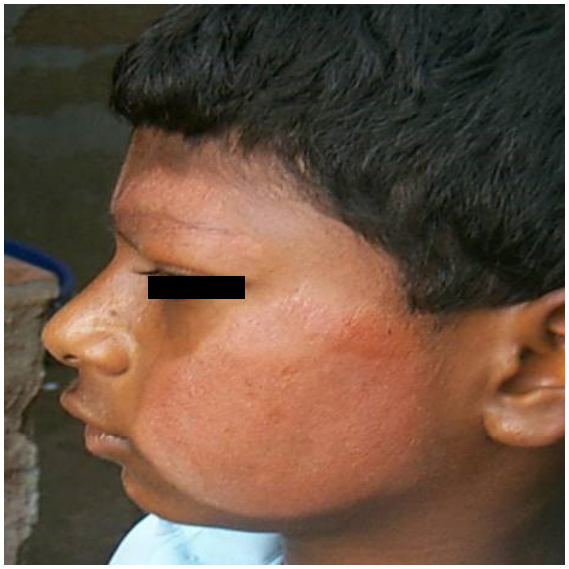
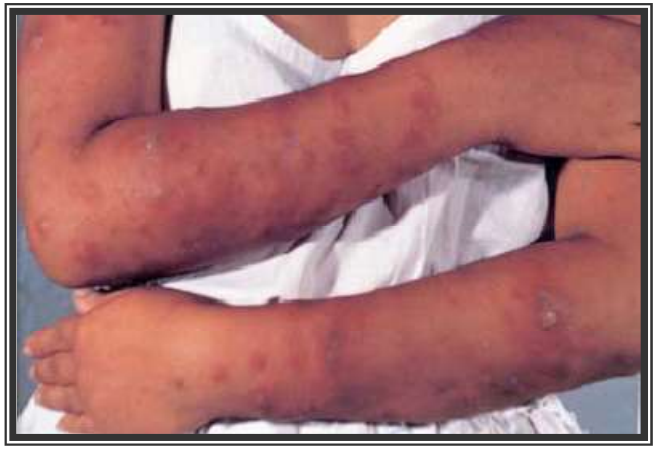
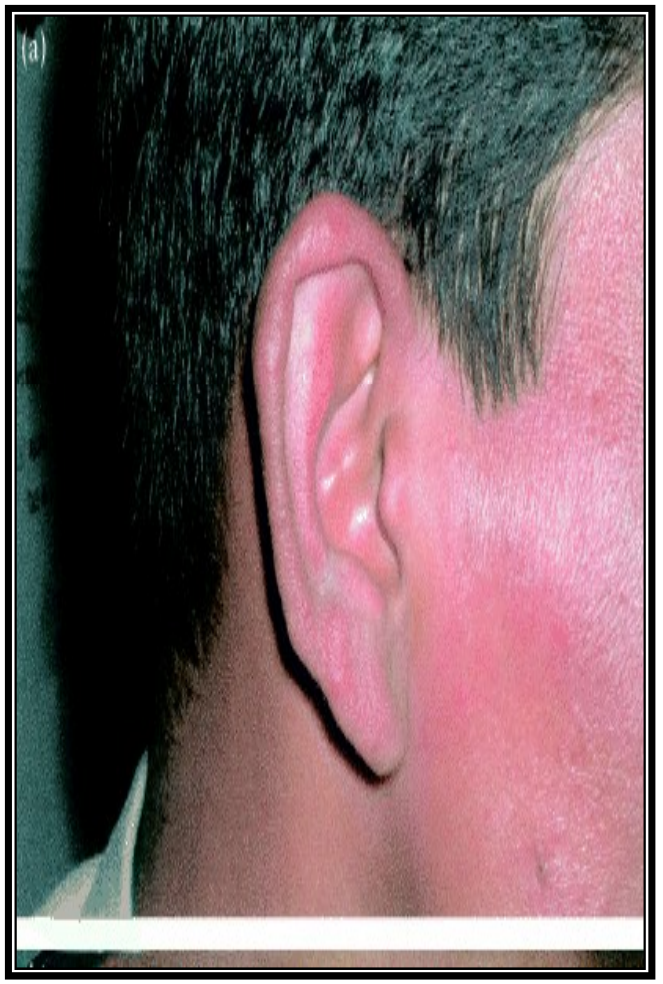
Skin lesions







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Involvement of nerves

- Permanent and progressive disability & crippling deformities

Consider involvement of nerve, if any of the following is present:-

- Thickening of nerve trunk
- Pain and tenderness in the course of the nerve
- Swelling (Abscess) in the course of the nerve
- Impairment of nerve function

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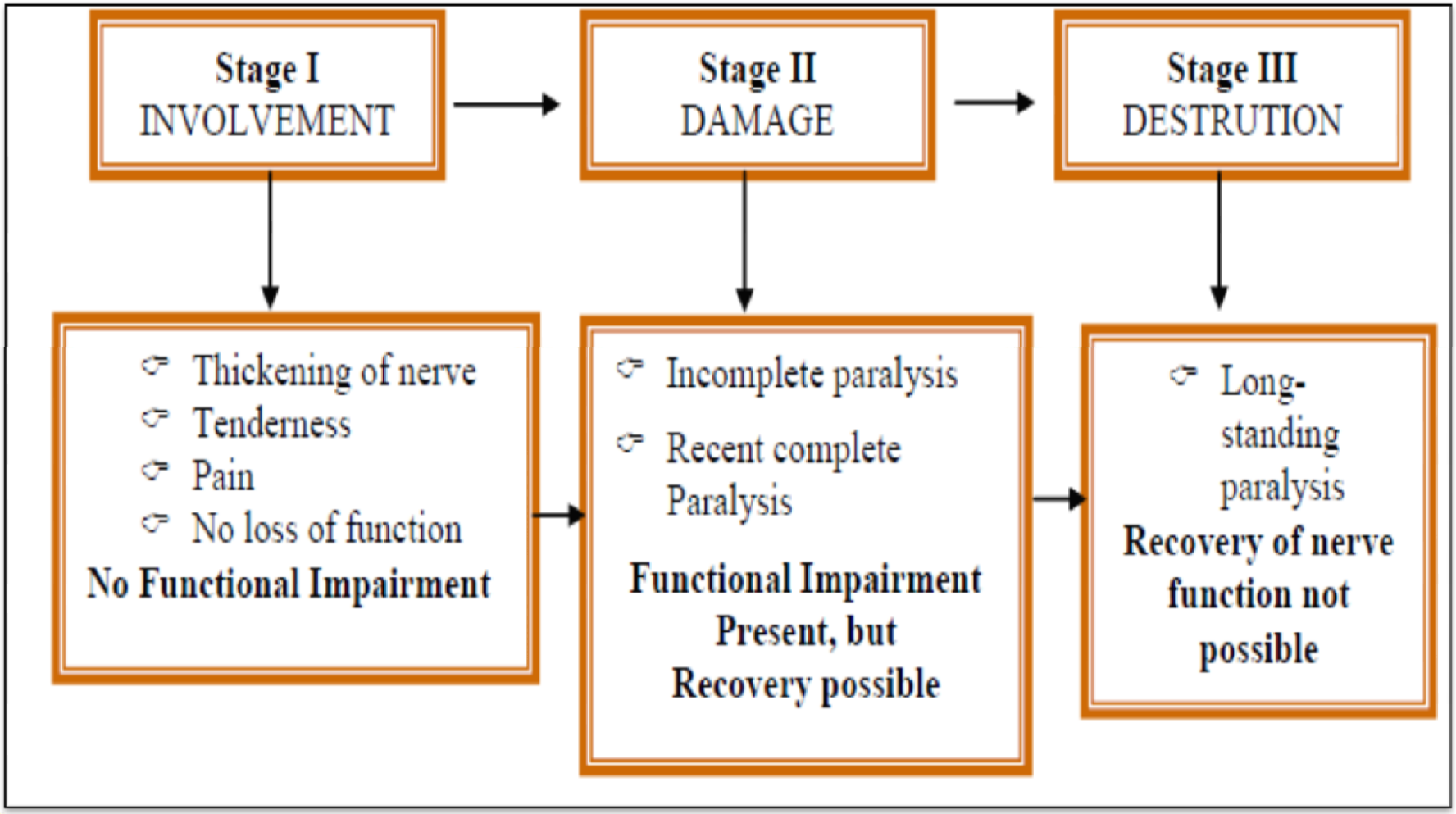
Stages of Nerve involvement



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Success of management of Leprosy lies in preserving the function of the nerves:

1. Preventing new nerve damage (if nerves are normal at the time of diagnosis)

2. Prevent further deterioration of already affected nerves

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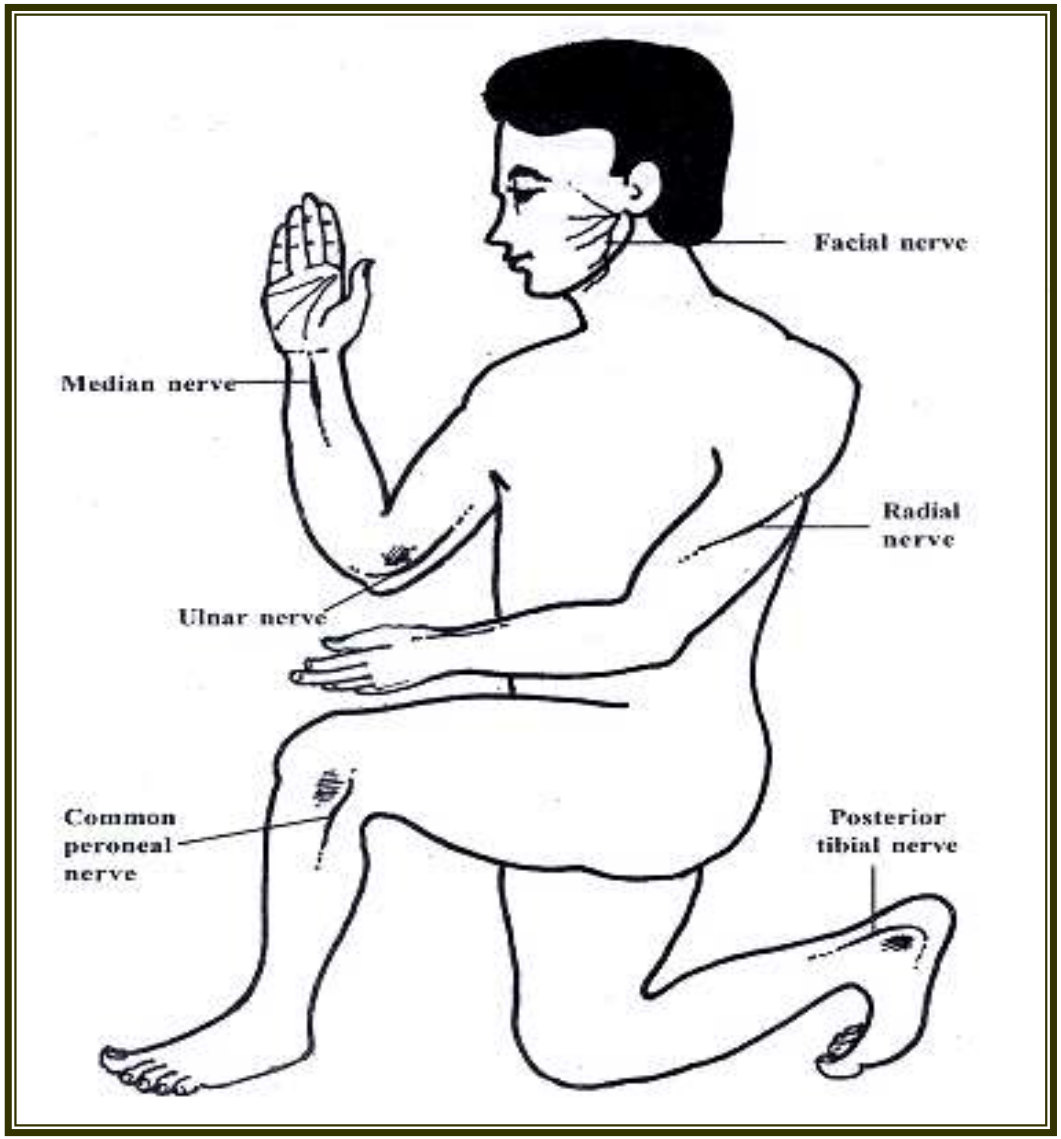
Commonly affected Nerves



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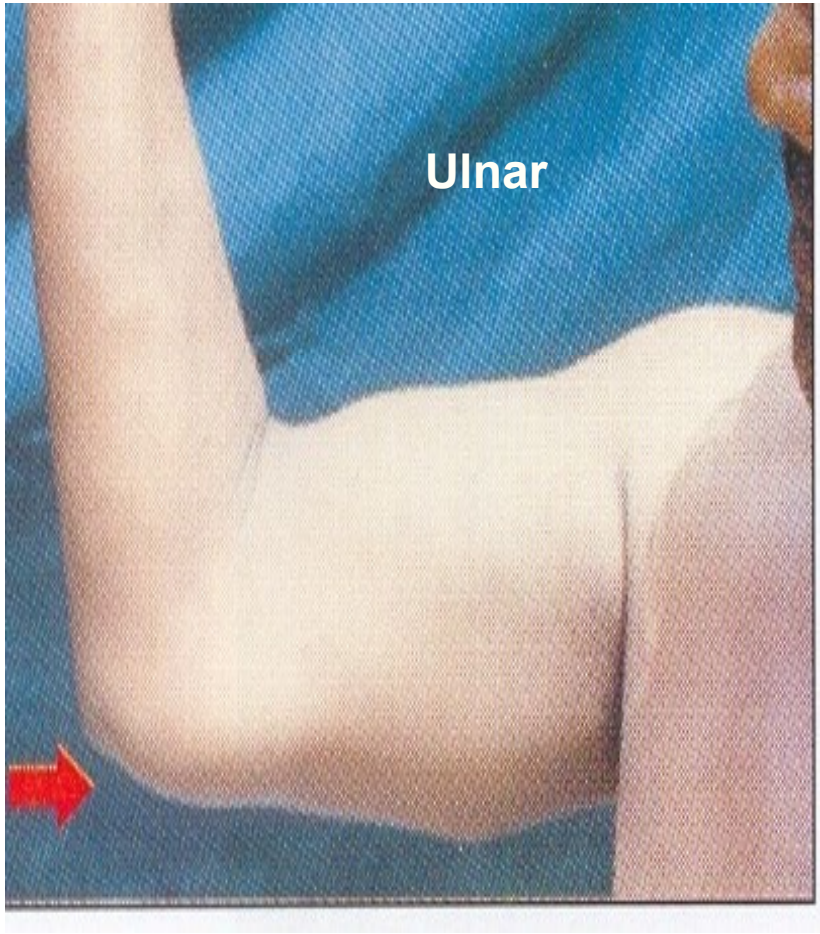
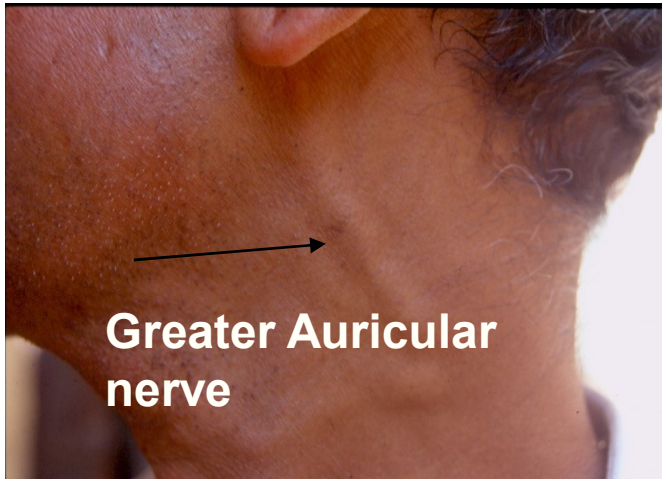
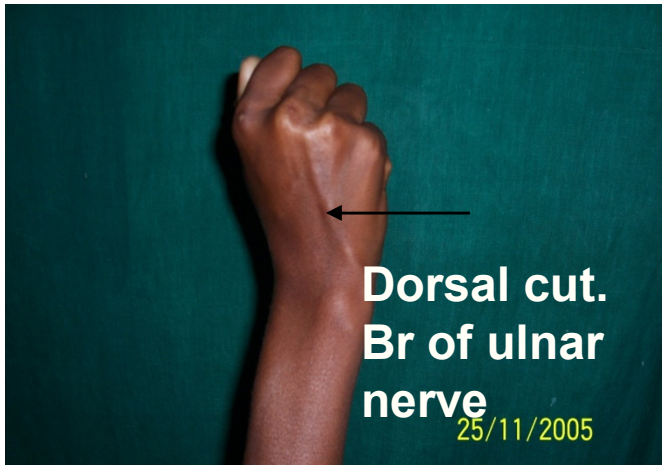
Enlarged/ tender nerves with / with out nerve function impairment







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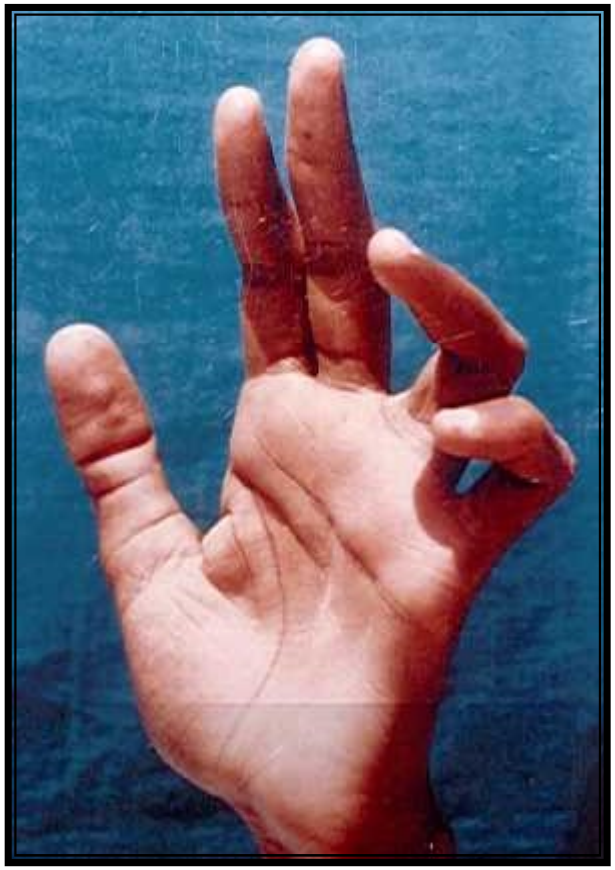
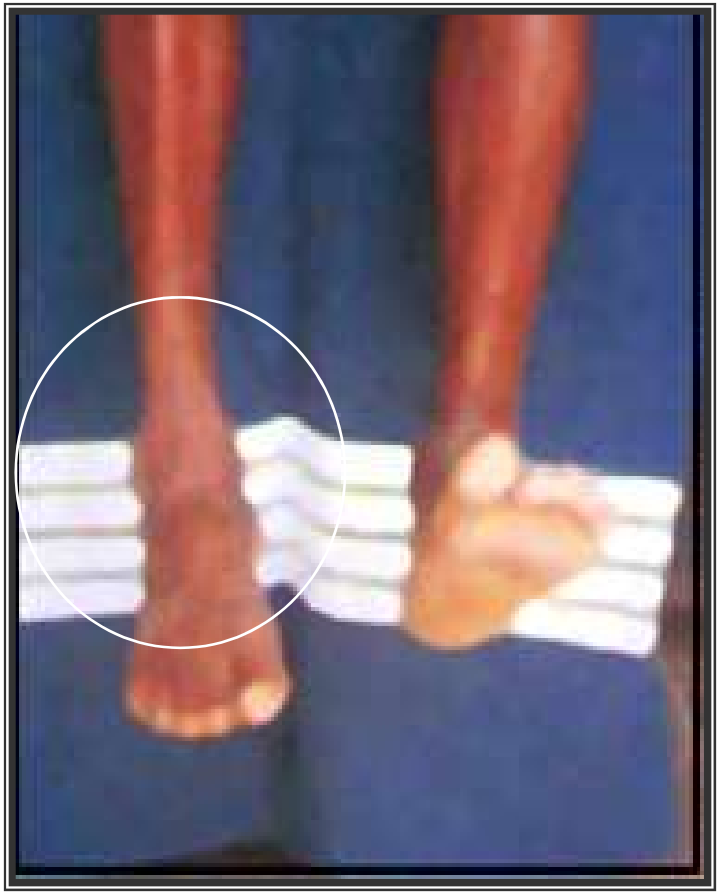
Disability & Deformities





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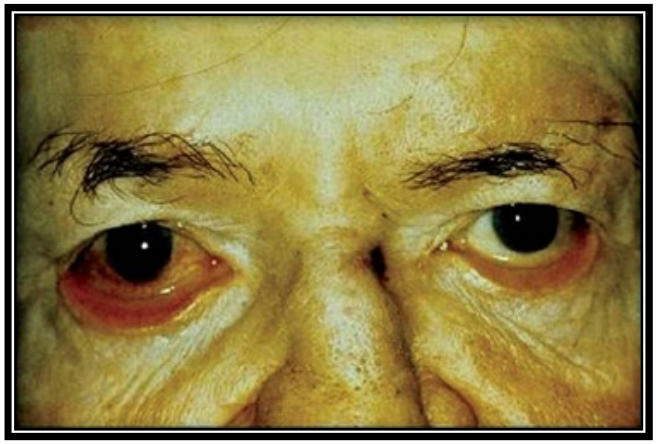
Other Manifestations of the disease: Eye



- Thinning of eyebrows
- Entropion
- Trichiasis
- Ciliary madarosis
- Scleritis
- Episcleritis
- Dacrocystitis
- Superficial punctate keratitis
- Interstitial keratitis
- Acute iridocyclitis
- Chronic iritis
- Iris atrophy
- Cataract
- Glaucoma
- Lagopthalmos
- LOWER eyelid
- Exposure Keratitis
- Impairment of vision

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Other Manifestations of the disease:

- Anosmia
- Chronic blockage of nose
- Crust formation
- Blood stained discharge
- Ulcers may appear on nasal
- Perforation of nasal septum
- Saddle nose deformity
- Hoarse cough & husky voice
- Dry, lusterless, shrunken narrowed and longitudinally ridged nails

- Leonine facies
- Bone cyst
- Medullary cavities
- Periosteum, Charcot jts
- Orchitis, Gynaecomastia
- Loosening of upper central incisors
- Reticulo-endothelial Sys
- Glomerulonephritis
- Pyelonephritis .
- Renal amyloidosis

Suspect Leprosy:

- Pale or reddish patch on the skin
- Shiny thick skin of face
- Swelling / nodules in the face and earlobes
- Reduced / loss of sensation in the skin patch
- Numbness or tingling of hands or feet

- Painful and tender/ palpable nerves (esp near elbow, wrist, knee, ankle)
- Weakness of hands, eyelids and feet
- Painless wounds or burns on the hands and feet
- Visible deformities of hands feet & eyes (claw hands and feet)

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Suspect Leprosy: On Complaints

- Chronic blockage of nose due to Infiltration and crust formation
- Things tend to fall/ slip out of the hand
- Things feel different while holding in the hand
- Hands or feet feel weak, slimmer with shiny skin , loss of hair
- Loss of sweating in an area
- Inability to retain chappal (foot wear without back strap)

- Big toe coming in way while walking
- Recent Impairment of vision
- Red painful eye
- Recent / worsening of existing Lagophthalmos (Inability to close eye/s)
- Trichiasis
- Epiphora
- Epistaxis
- Hoarseness of voice

Attributes influencing the pathogenesis

1. M.leprae - obligatory intracellular parasite, long generation time, dormancy & enhanced protection
2. Tropism for schwann cells & macrophages
3. Tendency to multiply in tissues with lower temperature

➢ Not toxin mediated – entirely due to host tissue response to bacillus or its antigen

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CLASSIFICATION OF LEPROSY

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IMPORTANCE OF CLASSIFICATION

- Identify the infectious cases – Epidemiological importance
- Decide upon the treatment options
- Identify the patients likely to develop the deformities and determine the prognosis
- Helpful in planning and evaluation of leprosy control activities

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Classification Criteria

1. Bacteriological criteria
2. Immunological factors
3. Histopathological features
4. Clinical features

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Well accepted classifications

- The Madrid Classification (1953)
- The Indian Classification (1955)
- New IAL Classification (1981)
- Ridley Jopling classification (1966)
- WHO Classification (1982, 1988, 1998)

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The Madrid Classification (Clinicobacterial)

Lepromatous type (L)
- Macular
- Diffuse
- Infiltrated
- Nodular
- Neuritic, pure

Tuberculoid type (T)
- Macular
- Minor tuberculoid
- Major tuberculoid
- Neuritic, pure

Indeterminate Group (I)
- Macular
- Neuritic type

Borderline Group (B)
- Infiltrated
- Others

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The Indian Classification (Clinicobacterial)

The Indian Classification (1955)

1. Lepromatous type (L)
2. Tuberculoid type (T)
3. Maculoanaesthetic (MA)
4. Polyneuritic type (P)
5. Borderline type (B)
6. Indeterminate type (I)

New IAL Classification (1981)

1. Lepromatous type (L)
2. Tuberculoid type (T)
3. Polyneuritic type (P)
4. Borderline type (B)
5. Indeterminate type (I)

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Ridley- Jopling Classification (1966) (Immunohistological)

- **Most widely accepted – academic & research purposes**
- **Spectral concept of leprosy**

  - Tuberculoid Leprosy (TT)
  - Borderline Tuberculoid (BT)
  - Borderline Borderline (BB)
  - Borderline Lepromatous (BL)
  - Lepromatous Leprosy (LL)

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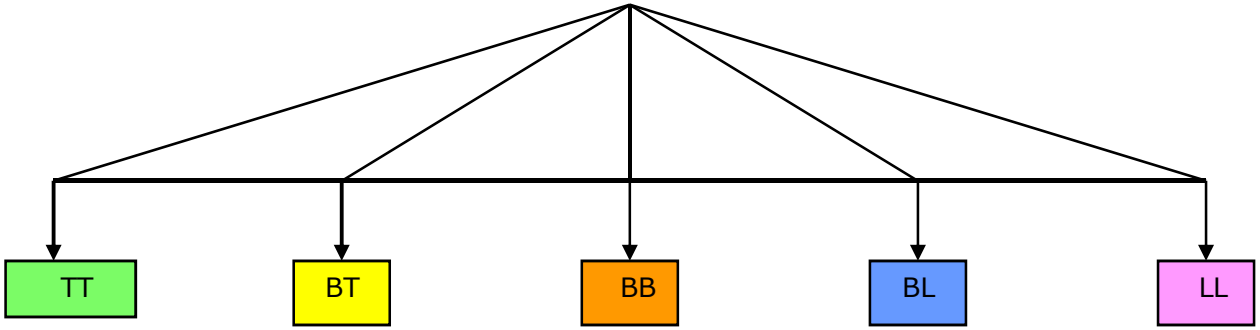
Ridley – Jopling Classification



	TT	BT	BB	BL	LL
No.of Patches	1-3	4 to multiple	Multiple	Multiple	Multiple
Size of Patches	Large	Large	Medium to Small	Small	Small
Sensations	Absent	Markedly diminished	Moderately diminished	Slightly diminished	Minimally diminished
AFB	Nil	Nil or scanty	Moderate in number	Many	Plenty
Lepromin reactivity	Strongly Positive	Weakly Positive	Negative / Weakly +	Negative	Negative

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WHO Classification (1988)

Paucibacillary

- Indeterminate - I
- Tuberculoid – TT
- Borderline Tuberculoid – BT
- Smear negative cases

Multibacillary

- Mid borderline – BB
- Borderline Lepromatous – BL
- Lepromatous – LL
- All smear positive cases

WHO Classification (1998)

1. Paucibacillary single lesion leprosy (SLPB)
2. Paucibacillary leprosy (PB) [2 – 5 skin lesions]
3. Multibacillary leprosy (MB) [6 or more skin lesions]

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Classification under NLEP

Characteristics	Paucibacillary (PB)	Multibacillary (MB)
Skin lesions	1 – 5 lesions	≥ 6 lesions
Peripheral nerve involvement	No nerve / only one nerve involvement	> 1 nerve involvement
Skin smear	Negative at all sites	Positive at any site

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Paucibacillary Leprosy

- Good CMI
- Localized disease
- Single or few skin lesions
- With/without peripheral nerve involvement
- Skin smear – usually negative

Multibacillary Leprosy

- Poor CMI
- Generalized disease
- Skin lesions – multiple
- Nerve involvement ++
- Other organ involvement
- Skin smear – usually positive

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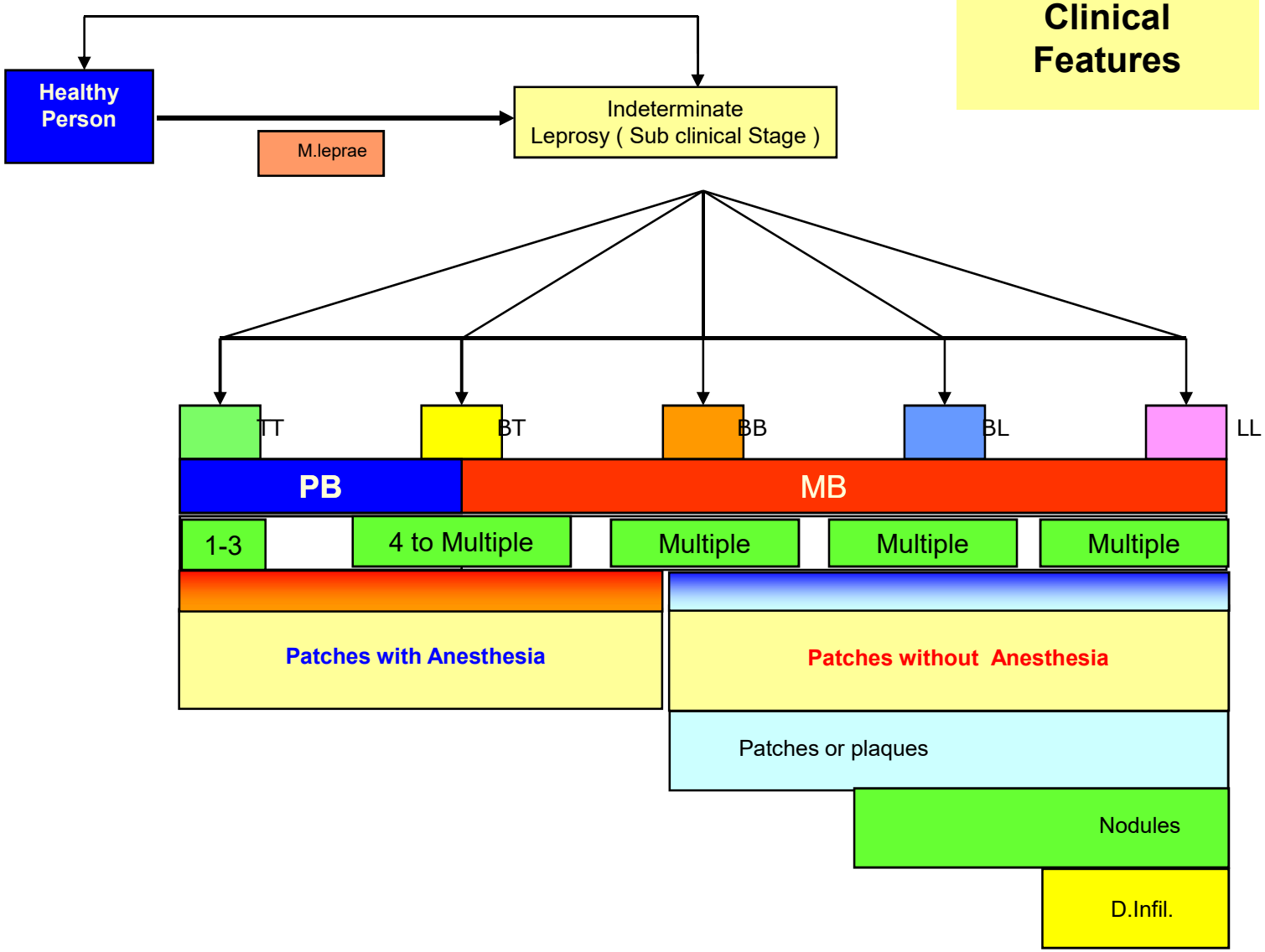
Clinical Features



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Treatment of Leprosy

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Advantages of Multi Drug Therapy (MDT)

- Safe, minimal side effects and increased patient compliance
- Interrupt transmission of infection by sterilizing infectious patients as rapidly as possible
- Prevents further complications and reduces chances of relapse
- Reduces chances development of resistance
- Reduces duration of the treatment
- Available in blister pack; easy to dispense, store and take

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Treatment of leprosy & std. regimen

- Cap Rifampicin: 10 mg/ kg body weight
- Cap Clofazimine: 1 mg /kg daily and 6 mg/kg for monthly dose
- Tab Dapsone: 2 mg /kg body weight daily

PB Adult: For people with PB leprosy and 15 years of age or more

MB Adult: For people with MB leprosy and 15 years of age or more

PB child: For people with PB leprosy and 10-14 years of age

MB child: For people with MB leprosy and 10-14 years of age

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Multi Drug Therapy (MDT)

Type of leprosy	Drugs used	Frequency of Administration Adults (children in bracket)	Dosage (adult) 15 years & above	Dosage (Children 10-14 years)	Dosage Children Below 10 years	Criteria for RFT
MB leprosy	Rifampicin	Once monthly	600 mg	450mg	300mg	Completion of 12 monthly pulses in 18 consecutive months
	Clofazimine	Monthly	300 mg	150 mg	100mg	
	Dapsone	Daily Once	100 mg	50 mg	25mg	
	Clofazimine	Daily for adults (every other day for children)	50 mg	50mg (alternate days)	50mg (Weekly twice)	
PB leprosy	Rifampicin	Once monthly	600 mg	450 mg	300mg	Completion of 6 monthly pulses 9 consecutive months
	Dapsone	Daily	100 mg	50 mg	25mg daily or 50 mg alternate days	

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"Leprosy work is not merely medical relief; it is transforming frustration of life in to joy of dedication, personal ambition into selfless service"

- Mahatma Gandhi

Gandhiji With Leprosy patient

www.nlep.nic.in

www.cltri.gov.in

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Thank you