

**PEDIATRIC PHYSICAL THERAPY
SMC-UOS**

ABNORMAL DEVELOPMENT

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Milestones of Motor Development

- 5-8 Months: Sitting
- 8-11 Months: Crawling
- 12-15 Months: Walking
- 2 years: kicks ball, runs, up/down steps
- 2-3 years: stands on one foot, jumps
- 3-5 years: catches and throws ball, climbs, skips and hops
- 5-7 yrs.: Catches & throws small ball, stands on one foot 10 seconds.



Principles of development

- A continuous process from conception to maturity
- Depends on maturation and myelination of nervous system
- The **sequence** is the same, the **rate** varies from child to child
- Primitive reflexes should be lost before the voluntary movement develops
- Cephalo – caudal direction of development
- Generalized mass activity individual responses
- No child is mentally retarded if backward in a single field of development and normal in all others

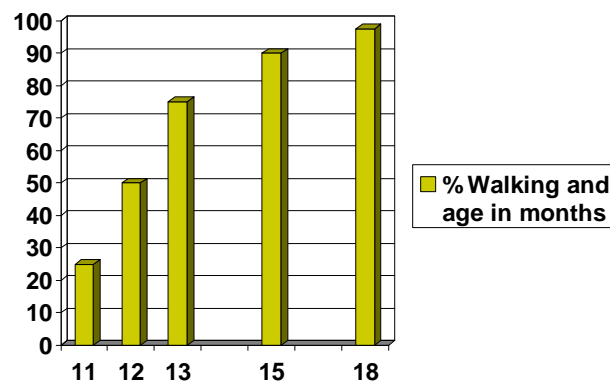
Introduction:

- An estimated 12-16% of children have a developmental and/or behavior disorder
 - Only 30% are identified before school entrance
 - Those detected after school entrance miss out on early intervention services proven to have long term health benefits
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- **Delay** - implies slow acquisition of all skills (global delay) or of one particular field or area of skill (specific delay), particularly in relation to developmental problems in the 0-5 years age group.

Development delay

- the condition where a child does not reach one of the stages of development at the expected For example, if the normal range for learning to walk is between 9 and 15 months, and a 20-month-old child has still not begun walking, this would be considered a developmental delay.

Age for walking for typically developing children



'Normal'



- *Median* age for walking is 12 months



- *Limit age (2 standard deviations above average)* is 18 months

Types of delay

- 1. Global developmental delay implies delay in acquisition of all skill fields (gross motor, vision and fine motor, hearing and speech/language, social/emotional and behaviour). It usually becomes apparent in the first 2 years of life.

- 2. Specific developmental delay is when one field of development or skill area is more delayed than others or is developing in a disordered way

Four Domains of Development

1. Gross motor skills
2. Fine motor and visual skills
3. Hearing, speech and language skills
4. Social, emotional and behavioural skills

Cognitive development refers to higher mental function

Abnormal motor development

This may present as delay in acquisition of motor milestones, e.g. head control, rolling, sitting, standing, walking or as problems with balance, an abnormal gait, asymmetry of hand use, involuntary movements or rarely loss of motor skills.

Causes of abnormal motor development include:

- cerebral palsy
- congenital myopathy/primary muscle disease
- spinal cord lesions, e.g. spina bifida
- global developmental delay as in many syndromes or of unidentified cause

INTRODUCTION

abnormal development

- Postural reflexes play dominant role---muscle tone
- Muscle tone---posture and movements
- Normal reflexes---normal development
- Abnormal reflexes---abnormal tone and posture---abnormal development
- Resulting abnormal sensorimotor development

Spastics

- Spastics in general lack movements
- Dominated by tonic patterns
- Too much stability & abnormal reciprocal innervations
- Fixed positions
- Tends to be fixed in progravity patterns
- Lack normal antigravity patterns
- Abnormal distribution of muscle tone
- Retention of pathological tonic movements
- Male development of righting and equilibrium reactions
- Abnormal rotation patterns
- Voluntary movement slow and limited in range
- Strong tonic labyrinthine reflex

Example-spastics

Prone to supine

- Retraction of shoulder and neck
- Extension at hip knee and ankle
- Inward rotation and adduction of LL
- Inversion of feet



Figure 2. A 9-month-old infant, born at term, who suffered severe ischemic/hypoxic encephalopathy at birth. Note the opisthotonic posturing with hyper-extension of the spine and neck, extension of the hips, and tight flexion of the fingers. This classical posture is correlated with defective corticospinal antagonism of normal brainstem function (preserved medial subcorticospinal pathway) due to extensive laminar necrosis of the cerebral cortex and sparing of subcortical structures.

ATHETOID

- Athetoid in general has too much uncontrolled mobility
- Movement lack proximal stability
- Postural tone fluctuates
- Control of movements during transitional stages is lacking
- Too much reciprocal inhibition
- Primitive reflexes are retained but not fix
- Righting reaction may be present but they manifest unpredictable movements
- Use distal stability and trunk
- Use head to control the posture


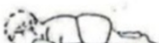
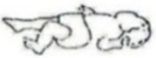
Athetoid- example

- Hypo tonicity
- Little tone to control stability
- Hyper extensibility
- Excessive extension with no counterbalance to extension



Normal development

Abnormal development

Age	A	F	K
By 3 Months			
	Lies straight on stomach; holds head up well; pushes up arms lies on back; brings two hands together	Still legs Cannot lift head Cannot push up on arms	Pushes back head to one side One arm and leg bent, the other arm and leg straight cannot bring hands together

Normal development

Abnormal development

by 6 months



Sits leaning on hands
takes weight on feet
when held in standing



Cannot lift head
Round back
Stiff arms and
fisted hands



Head falls back
when he is
pulled to sitting

L



Tiptoe standing
arms pull back
stiff legs which
are crossed
like scissors

Normal development

Abnormal development

By 9 months



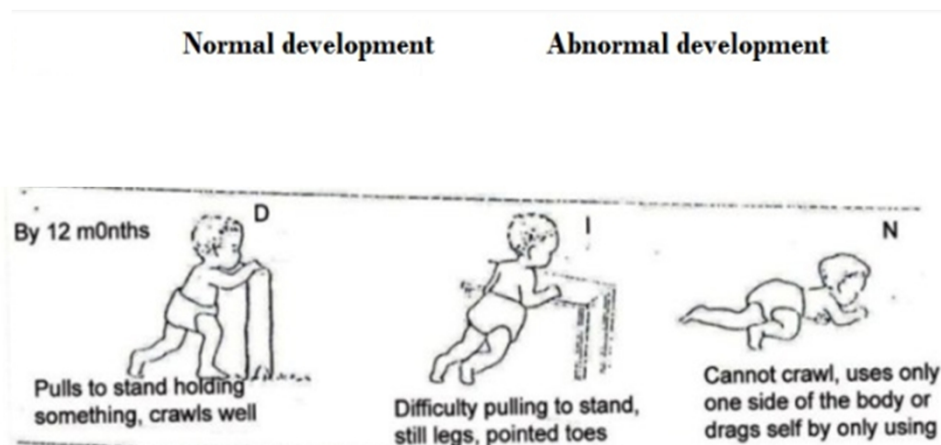
Sits alone, reaches out,
supports self when
placed standing



Round back
Poor use of hands for play
Stiff legs, pointed toes



Does not take weight on
legs poor head lifting



**PEDIATRIC PHYSICAL THERAPY
SMC-UOS**

Red flags & abnormal development

Red flags (1) – newborn

- State of arousal
 - Lack of **alertness**
 - Poor quality of **sleep**
- Abnormal **cry**
- Feeding problems, **drooling**
- Spontaneous motility (abnormal movements)
 - Tremor & seizures
- Abnormal **tone**
- Abnormal **head size or shape**

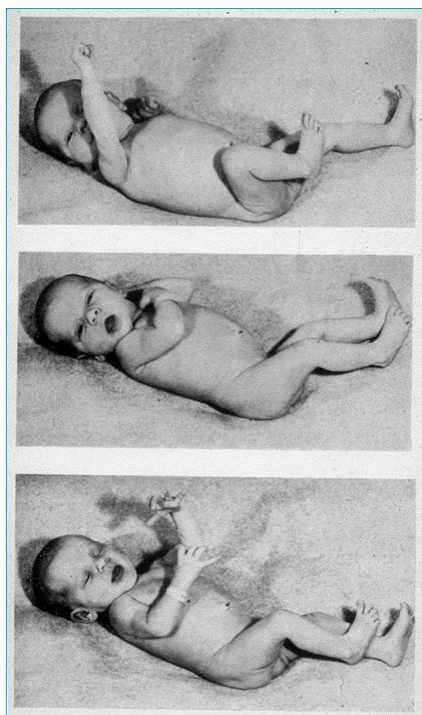
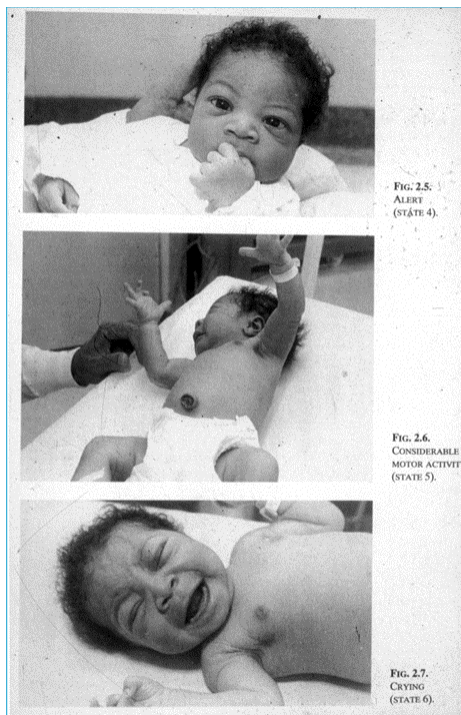
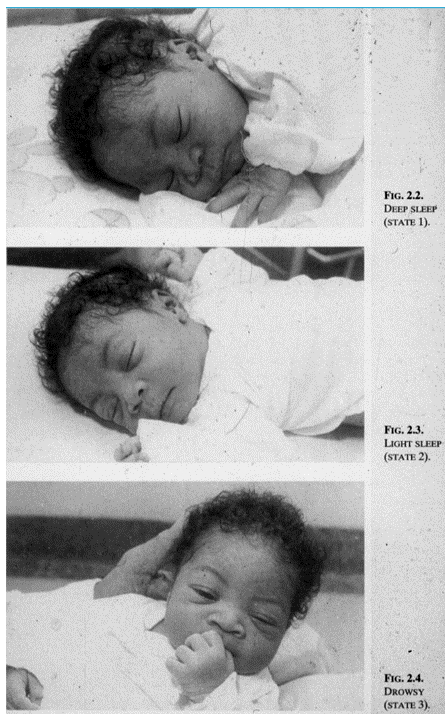




FIG. 155

Abnormal appearance of child aged 8 days. Hands tightly closed. The legs tend to cross and they are unusually extended. Knee jerks normal. Cerebral haemorrhage. Severe convulsions age 3 days. (As FIG. 82.)

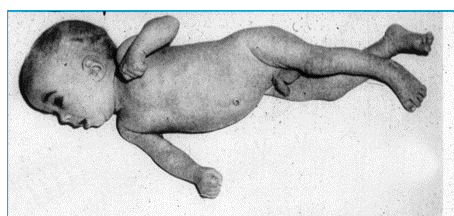


Fig. 11. Opisthotonic posture in a 14-day-old baby with hydrocephalus.

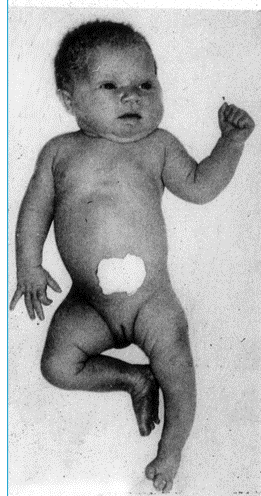


Fig. 12. An asymmetrical posture: paresis of right upper and lower limbs.

Fig. 2a. Microcephalic head

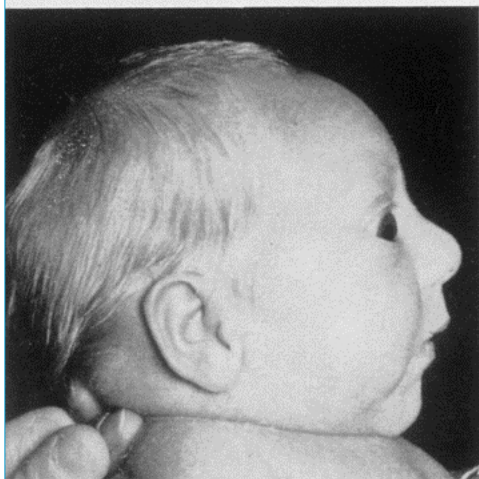
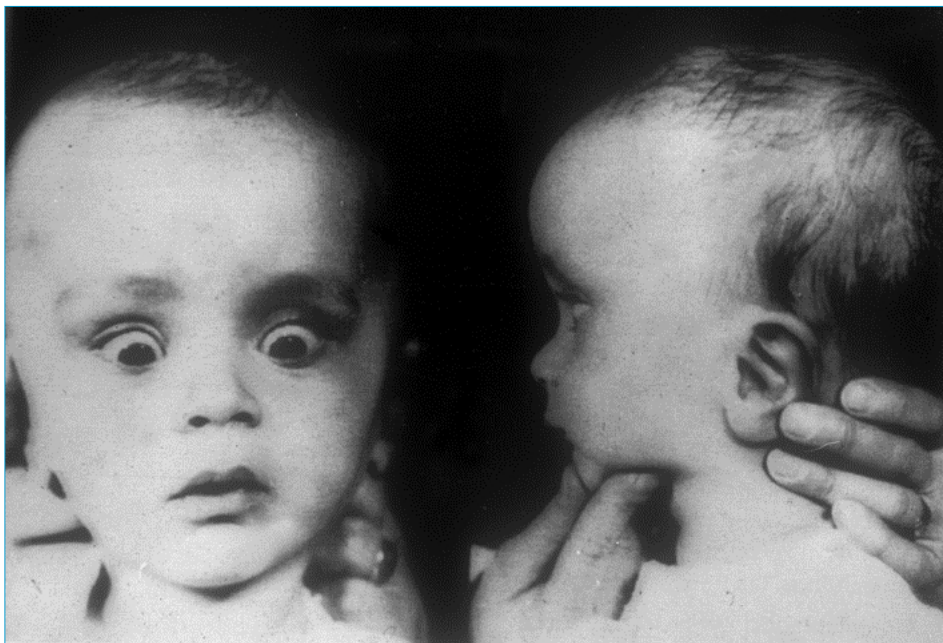
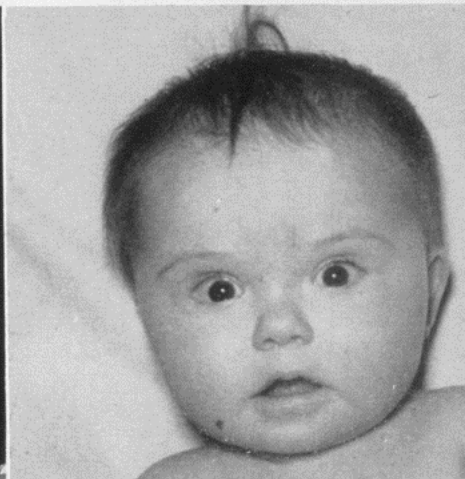


Fig. 2b. Hydrocephalic head



Head size:

It is easy to remember the following average figure.

- 35 cm at birth
- 47 cm (another 12 cm) at 12 months
- 49 cm (another 2 cm) at 2 years
- 50 cm at 3 year
- 52 cm at 6 years
- 53 cm at 10 years
- 56 cm as adult



Red flags (2)

Infancy/ early childhood

- Increased or reduced head circumference
- Lack of alertness, delayed social smile
- Poor head control (at 3-4 months)
- Persistent primitive reflexes (ATNR)

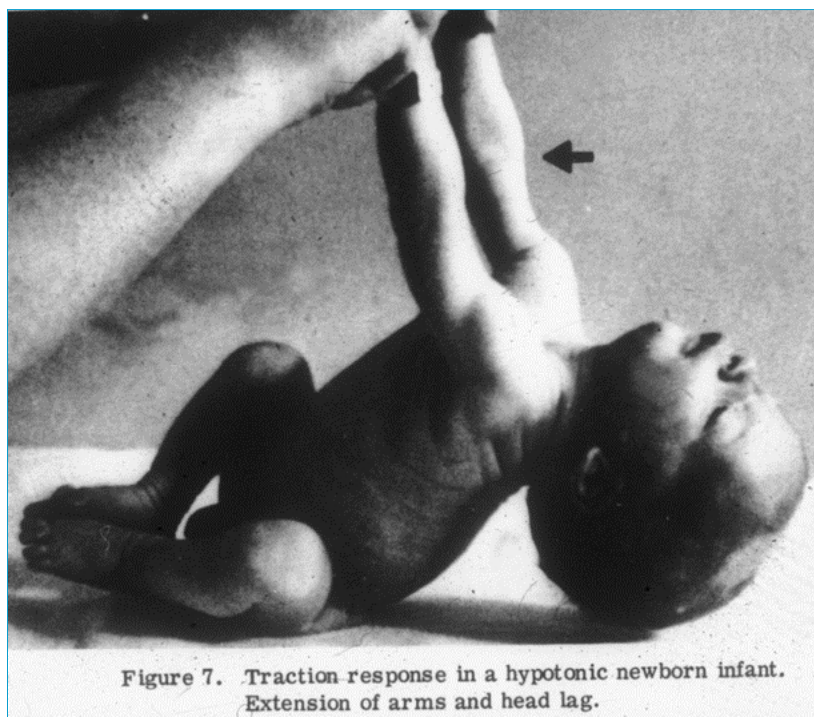
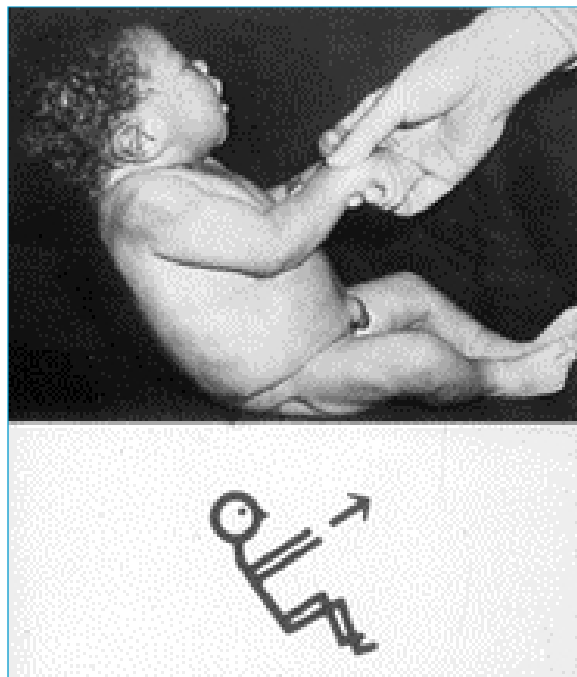
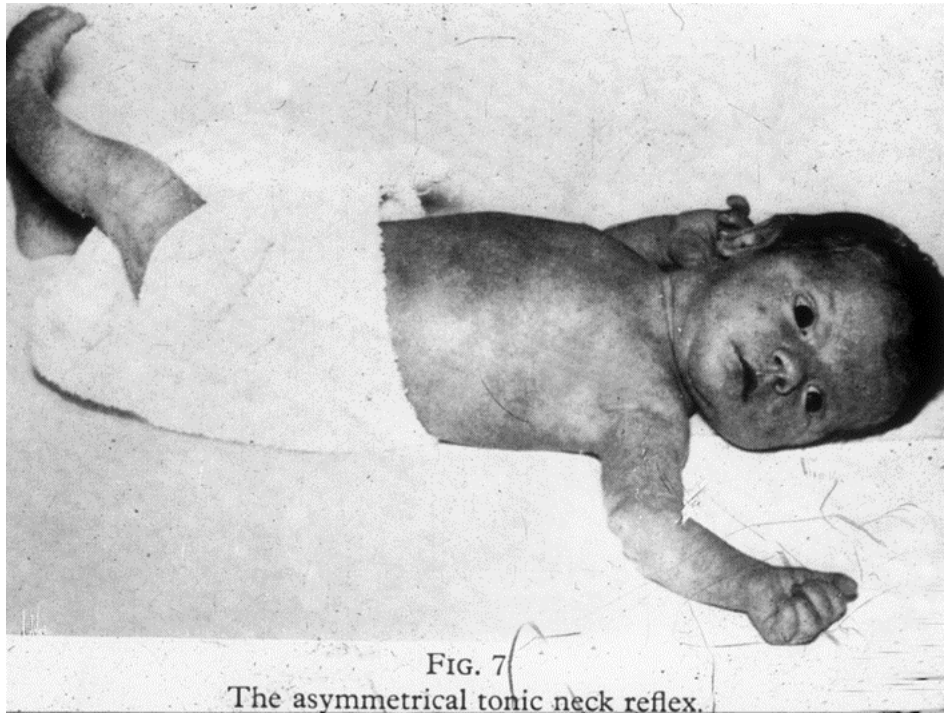


Figure 7. Traction response in a hypotonic newborn infant. Extension of arms and head lag.



Red flags (3)

Infancy/ early childhood

- Early asymmetry (handedness <12 months)
- Increased tone
 - Constant fisting >3 months of age
 - Scissoring
 - Equinus position of feet, toe walking
 - Extensor tone in supine position
 - Spastic hand approach and grasp
 - Persistent and sustained clonus
- “Changing tone” baby

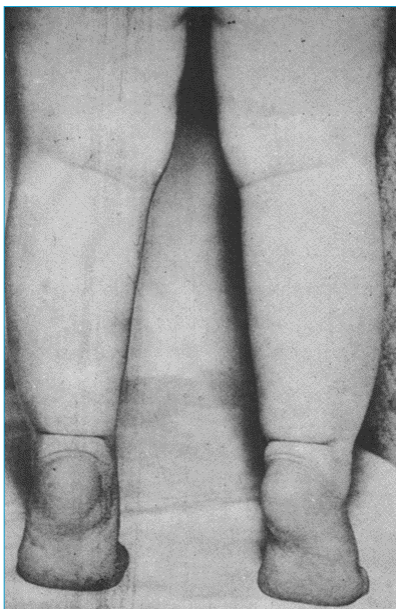
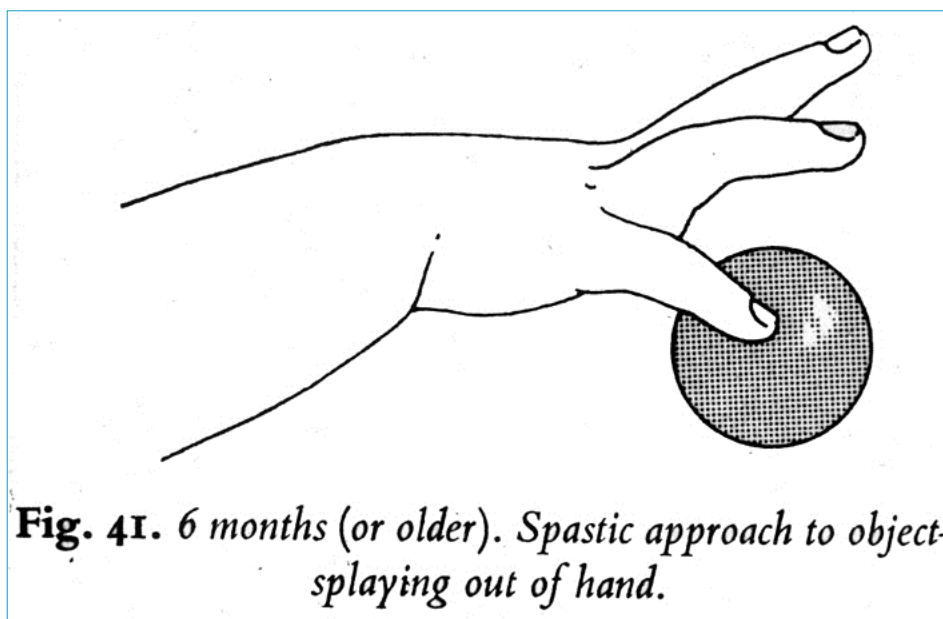
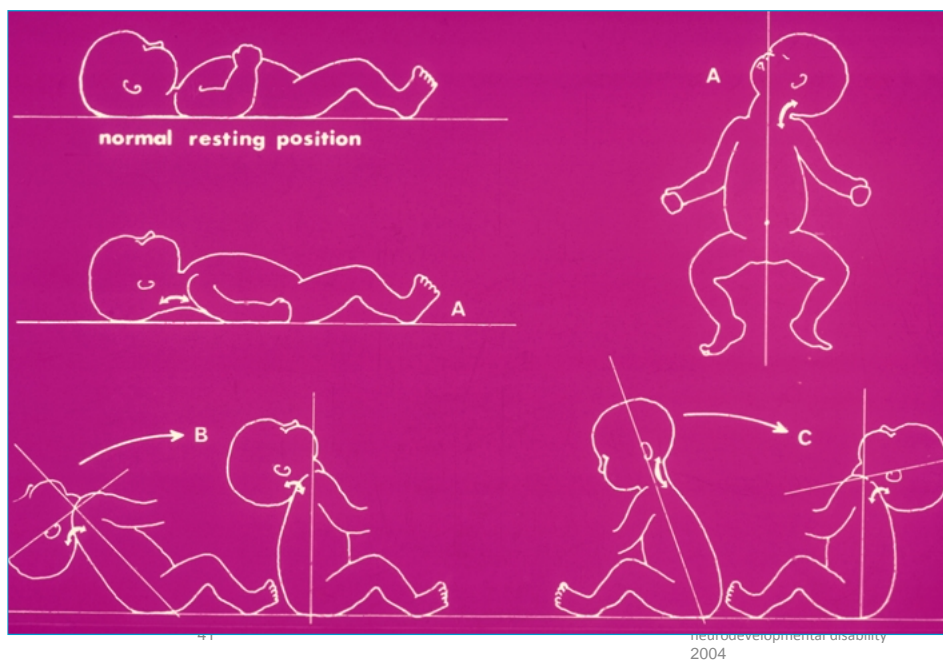
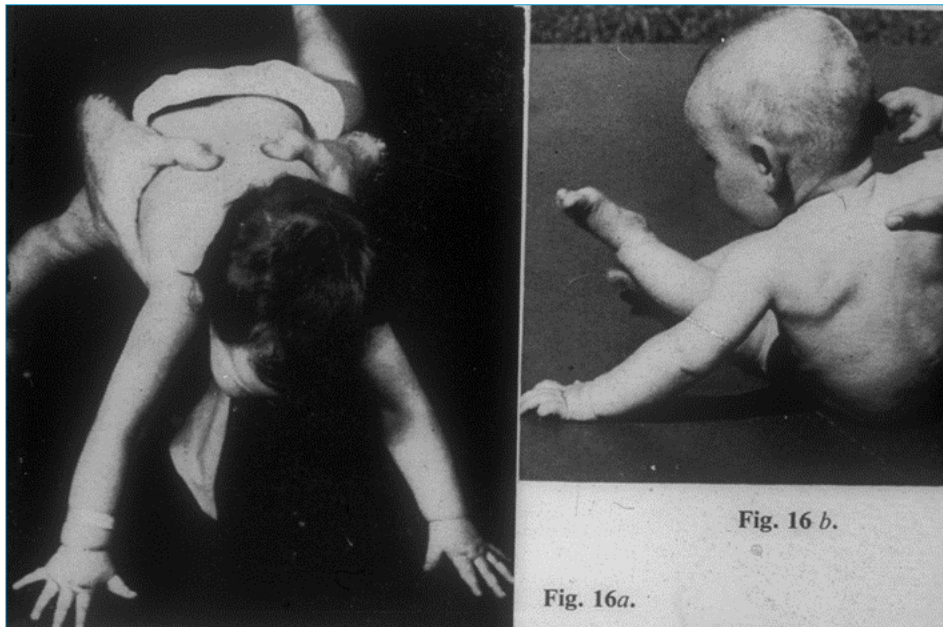


FIG. 161
Toe walking due to congenital shortening of the Tendo Achillis.
There is also a constriction band.



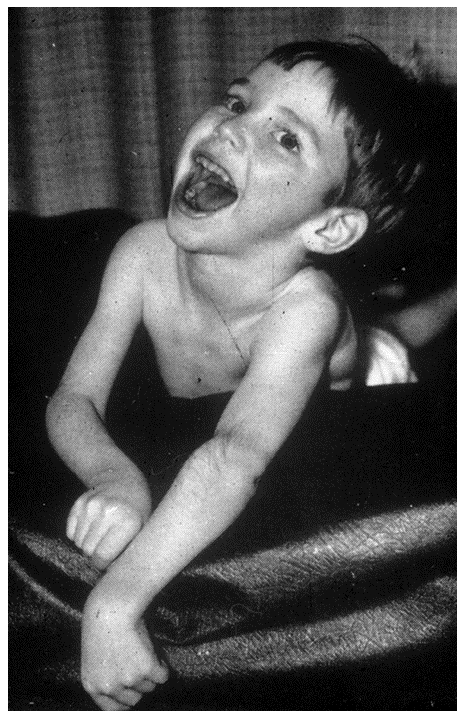
Red flags (4) Infancy/ early childhood

- Delayed appearance of postural reflexes and developmental milestones
- Increased associated tone and movements in one limb (paretic limb)
- Visual problems
 - no visual following, persistent squint
- Lack of social/Communicative skills
 - Lack of auditory response, delayed speech, avoiding eye contact, repetitive behavior, desire for sameness, social isolation, lack of imaginative play



Essential to remember!

- Periodic repeated exams
- Clinical pattern of CP evolves over time:
 - hypotonia → spasticity → “changing tone” -
dystonia → dyskinesia
- Testing intelligence using conventional tests often erroneous in CP:
 - Associated motor problems, visual, auditory and speech deficits



thanks

Ask?