MANAGEMENT OF A CHILD WITH PARALYSIS AFTER POLIOMYELITIS

By

KAMAL ZORKANI

Professor of Orthopaedic Surgery,

Cairo University

I am honoured to be invited to contribute in this scientific meeting which has a noble target : Health and happiness of children of the Nile Valley.

We have selected poliomyelities to be the subject in this meeting because it is of interest to several medical specialities, and before all the responsibility of the Public Health Authorities to make the vaccine available, and National Guidance to inform the public about the importance of vaccination of infants.

Poliomyelitis is an infectious disease caused by a virus of which there are immunologically three type, Brunhilde, Lansing and Leon. The source of infection is always human, a patient a convalescent, or a carrier, The virus is present in the nasopharynx and in the stools. The disease is propagated by flies.

The virus enters the body through the wall of the alimentary tract in which it establishes itself, multiplies and disseminates by the blood stream. In a few susceptible patients the central nervous system is invaded. The poliomyelitis virus predelicats the motor cells of the spinal cord and the brain stem. Many cases of poliomyelitis are abortive or non-paralytic. Luckily, paralysis occurs in minority of cases. Certain factors seem to precipitate onset of paralysis, namey:Physical exhaustion as by a long journey, tonsillectomy, and intramuscular injection. These should be avoided in presence of an epidemic.

Infantile paralysis passes through three clinico-pathological stages:

Acute stage: There is inflammatory reaction in the C.N.S., There is fever for one or two days followed by paralysis which is variable in distribution and severity, but is maximal in one day. The infant is watched for presence of pharyngeal paralysis, and paresis of respiratory muscles.

Convalescent stage: The inflammatory reaction in the C.N.S. disappears after 3–6 weeks from onset of the acute illness. Muscle tenderness disappears, and power gradually returns to the paralysed parts.

A motor unit is the anterior horn cell, its axon, and the muscle fibers which it supplies; one axon amy innervate hundred or more mscle fibers. Muscle power recovery can be explained by :

1– Resumption of activity of the anterior horn cells which suffered reversible

changes.

2– Axonal sprouting from the normal axons of a partially paralysed muscle to muscle fibers of other motor units.

3– Hypertrophy of muscle fibers in a partially paralysed muscle.

Return of muscle power is noticeable in the first three months occurs mostly in the first year, but can improve up to two years. A muscle which is weak in the fourth month will improve in power by treatment. A muscle which is completely paralysed in the fourth month will usually remain permanently paralysed.

The child is examined periodically to test the power of each muscle, and record its grade. Any deformity should be detected early, and should be prevented and corrected.

Chronic stage: The child has residual paralysis of the lower motor neurone type, deformities are sometimes present.

Grading of muscle power:

Zero : No contraction.
Grade 1: Flicker contraction
Grade 2: Active movement is possible when gravity is eliminated.
Grade 3: Active movement against gravity.
Grade 4: Active movement against gravity and resistence.
Grade 5: Normal power.

Deformities at joints are caused by imbalance in the power of the muscles acting on the joint, and by the action of gravity. In the start it is possible to correct the position of a joint passively, later the deformity becomes fixed by contracture and shortening of the joint capsule, ligaments and muscles. Paralytic dislocation may occur. There is atrophy of the paralysed muscles. When there is extensive paralysis in a limb there is also disuse bone atrophy and sluggish peripheral circulation. Retardation in growth of the affected lower limb results in shortening which results in inequality of the limb length of a few centimeters.

PROPHYLAXIS

All infants from the age of three months must be vaccinated. Sabin vaccine is attenuated live virus, and is given by mouth two drops every month for three months. A booster dose is given after six months, and after one year. The vaccine should be kept in the ice chest, and the infant should be healthy at the time of vaccination: No fever, no cattarh, no diarrhea.

Since vaccination has been freely popularised, there are no epidemics of poliomyelitis. The sporadic cases which are seen mhappen in infants whohave not got the chance of proper effective vaccination.

Salk vaccine which is dead virus given by subcutaneous injection is less

frequently used now.

The vaccine contains the three strains of the virus.

MANAGEMENT OF THE ACUTE STAGE:

The pediatric physician cares for the sick child. The infant is transferred to the medical center when there is paralysis of the pharyngeal muscles or paresis of respiratory muscles.

(a) *Complete rest:* The paralysee limb is supported by pillows. Anyform of stress is avoided as it may increase the extent of the paralysis: No injections, and no transport for a long journey.

(b) *Hot packs:* relieve pain and muscle spasm.

(c) *Paralysis of pharyngeal muscles:* The infant can not swallow. He is nursed prone, the foot of the bed is raised and secretions are sucked. Feeding is by a stomach tube.

(d) *Paralysis of the respiratory muscles:* The infant is put in the respirator as soon as there is evidence of weakness of the respiratory muscles.

Combined paralysis of pharyngeal muscles and respiratory muscles may occur, tracheostomy and controlled positive pressure respiration are urgently needed.

MANAGEMENT OF THE CONVALESCLNT STAGE:

The child is cared for mainly by the physiotherapist who is directed by the orthopaedist. The purpose of treatment in this stage is t okeep the muscles and joints in their best condition awaiting recovery of muscle power.

(a) *Prevention of deformity:* Passive movement of each joint into its full range every day. Night splints are applied to prevent foot drop or wrist drop.

(b) *Exercises:* Weak muscles are strengthened by exercises, which are graduallly increased in severity and skill, at first assisted, then against gravity, and resistance.

(c) *Braces:* A brace assists the child to assume the erect posture and walk. Can be fitted when the child is above the age of two year and there should be no fixed deformity of the part. The brace should be simple, light, and really assists the child to walk. When the trunk muscles are involved it is advisalble to keep the child recumbent in the first three months.

MANAGEMENT OF THE CHRONIC STAGE: After two years from the onset of poliomyelitis there is hardly any prospect for recovery of power in the paralysed muscles. There is residual paralysis in some muscles. We help the child to walk and use his hands, a brace is given for support until he reaches the age suitable for surgery in order to discard the brace.

(a) Physiotherapy is continued to prevent deformity, keep the joints mobile,

strengthen weak muscles, and improve the nutrition of the limb.

(b) *Correction of deformity:* The common deformities are equinus at the ankle, flexion of the knee and flexion-abduction of the hip. Mild early deformity can be corrected conservatively by gradual stretching. Old standing established deformity requires operation of soft tissue relaese in which short ligaments are cut, and short tendons are lengthened. Osteotomies as calcanean osteotomy for heel inversion, and supracondylar femoral osteotomy can be done in odler children for residual deformity after soft tissue release. Arthrodesis of flail joints is usually done aftre the age of twelve years when there is skeletal maturity.

Each segment of every part is examined for presence of deformity and for assessment of the grade of muscle power. The respiratory muscles are examined before any operation for anaesthetic risk: Chest expansion and andominal movements during inspiration, and contraction of the abdominal muscles for coughing.

Pelvic tilt may be caused by deformity of the lower limb and/or paralysis of the trunk muscles. When the trunk is normal pelvic obliquety should disappear while sitting.

Lower Limb:

The knee is the key for the erect posture. It should be straight, or better ten degrees hyperextension when the quadriceps is paralysed. Progressive recurvatum tends to occur when the hamstrings are also paralysed.

The foot: The aim is a plantargrade foot i.e. without deformity, of normal shape, stable on the ground, and with some resiliencs for walking on rough ground. Plantarflexion at the ankle is important for the take off during walking and for the sense of the foot catching the ground. Dorsiflexion is important for prevention of foot drop during the swing phase of the gate. Tendon transfer is often done to restore balance bwetween the invertors (tibialis posterior), and the evertors (peronei), often with arthrodesis of the tarsal joints.

The hip: A tight ilio-tibial band causes flexion-abduction deformity of the hip, which should be corrected by soft tissue release (Soutter's operation). Paralysis of the gluteal muscles causes lurching during walking. Paralytic dislocation of the hip may occur when the adductors are powerful and the glutei are paralysed, the ilio-psoas tendon may be transferred laterally, or a shelf is made at the roof of the acetabulum.

Trunk: Scoliosis is present when the abdominal muscles are paralysed or the spinal muscles are paralysed. The spine may be collapsing during sitting and standing. A brace is given for the trunk. Spinal fusion may be done in adolescence after examination of the respiratory muscles.

Upper limb: The upper limb joints serve the hand, the shoulder is the fulcrum, and the elbow for the reach. The finger movements serve non prehensile purposes and to hold objects by pincer action and power grip. Thumb opposition is 50% of the hand value.Tendon transfer is often performed for the aske of finger movement .The wrist flexors and extensors are used with arthrodesis of the wrist joint. The thumb may be fixed in the position of opposition by a bone graft as an intermetacarpal strut between the first and second metacarpals.

Elbow: Elbow flexion can be possible by Steindlers' operation in which the common flexor origin is transferred proximally, or by use of the pectoralis major as a motor. Elbow extension is by gravity.

Shoulder: When the deltoid muscle is paralysed, the shoulder joint is arthrodesed at the gleno-humeral joint. The patient can raise the arm above the head and lower it by moving the scapula on the schest wall. The patient should be above the age of twelve years, having a useful hand, and good scapular muscles. The shoulder is arthrodesed in the optimum position of function. The step-method described by us gurantees bony arthrodesis.