Motor nerve damage may cause loss of muscle strength, especially in the lower back and legs, in some patients. In most cases with weakness, it is mild, but it may progress sufficiently in some patients to necessitate use of walking aids or a wheelchair.

Long found that 84% of his survey patients walked alone, whilst 15% used aids and 1.2% were wheelchair bound. Patients with thoracic cord involvement developed progressive paraplegia and 2 with cervical arachnoiditis became quadriplegic.

Aldrete reported abnormalities of gait in 48% of his patients.

A COFWA (online USA-based support group) member, David Gaub, ran a small survey in late 1998, to assess the impact of arachnoiditis on walking. 49 COFWA members took part, the majority of whom had undergone multiple spinal insults.

On average, they had begun to experience sustained walking difficulties 12 years after their initial back problems. Mr. Gaub felt that the most significant finding of the survey was that most respondents developed walking difficulties after an incident such as a fall, auto accident, further surgery or meningitis. In some cases, the incidents were relatively minor and the resultant loss of function could not be directly attributed to damage from the incident itself.

However, 31 of them described a rapid deterioration since the incident. It may be that decline within a couple of months relates to a threshold number of affected motor nerve roots being reached and breached, so that the muscles supplied by those atrophying nerve roots will start to waste and lose strength progressively.

It may also be simply that additional nerve root damage is sufficient to affect enough different muscle groups for the overall functional deficit to be clinically significant whereas previously it had remained occult.

38 of the respondents reported using an assistive device such as a cane or a walker,

10 used a motorised scooter or a wheelchair most of the time. They noted problems with fatigue, relationship issues and limits of socialisation.

Depression is common, the effect on morale being understandably severe bearing in mind the loss of physical activities enjoyed previously, and the increasing isolation experienced.

Weakness: was reported in Aldrete's study as paraplegia in 3 cases (1.8%).

In the global survey, 68% of respondents had reduced mobility (house/chair/bed bound).

Also, many patients report that their muscles fatigue more quickly than before. There may be compensatory overuse of some muscle groups to allow the patient to walk, but this leads to the muscle fatiguing more rapidly than normal. This is similar to the picture seen in Post Polio Syndrome (PPS).

Balance problems: may be due to a combination of sensory impairment (loss of proprioception and other sensory modalities) and motor deficit. In the Global survey, 70% of respondents reported this problem (49% in New Zealand survey).

Increase in muscle tone is quite a common feature and makes the legs stiff, which may have an effect on mobility. Stiffness was reported by 73% of the New Zealand survey respondents and 79% of the Global Survey.

Aldrete recorded hyperreflexia in one leg in 4.3% of his patients, and hyporeflexia in one leg in 60% (both legs 36%). Long noted chronic muscle contractions (usually secondary to surgery) in 94% of his survey patients.

Spasticity is increased resistance to passive limb movement, also called hypertonia.

This can be caused by upper motor neurone damage or by biomechanical changes in muscles affected by abnormal spinal dynamics. The neurogenic component of spasticity can cause muscles to be held in a contracted state over prolonged periods.

This in turn can lead to shortening of the soft tissues and further biomechanical changes within the affected muscle. Left untreated, severe cases can involve abnormal limb posture which prevents muscle stretching and perpetuates further deformity.

Spasticity can cause harmful effects:

- Muscle spasms are associated with pain and difficulty in sitting and maintaining posture
- Abnormal trunk and limb posture can be associated with contractures, and pressure sores
- Loss of function leads to reduced mobility and difficulty with self-care and hygiene and later osteoporosis
- Fatigue can impact on mood and pain levels
- Secondary effects include difficulty with sexual intercourse, poor sleep patterns and depression

Spasticity is not always harmful: patients who have combinations of muscle weakness and spasticity may rely on the increased tone to maintain the ability to stand or walk.

Spasticity is measured using the Ashworth scale:

Grade 0 is no increase in tone

Grade 1 is a slight increase giving a ?catch and release' effect, or minimal increase of resistance at the end-range of movement when the limb is flexed or extended.

Grade 1+ is slight increase in tone giving a catch followed by minimal resistance throughout the remaining range of movement

Grade 2 is more marked increase in tone through most of the range of movement, although affected parts still move easily

Grade 3 is considerable increase in tone such that passive movement is difficult and the joint movement of range is limited.

Grade 4 involves affected parts being rigid either in flexion or extension.

Muscle spasms and cramps may be violent and painful, particularly at night and may persist for several hours.

Muscle twitches (fasciculations) are usually painless and transient. In the Global survey, 81% of respondents experienced this type of problem, 89% of the New Zealand respondents and 91% of those in Long's survey.

Aldrete found 64% of his survey cases suffered from muscle spasm.

Note: fasciculations and cramps may be seen in Hyperthyroidism (history of myelogram dye is a

risk factor). Cramps and stiffness with muscle pain may be features of hypothyroidism.

Myoclonus: a brief, sudden, shock-like muscle contraction, mediated by an electrical nerve discharge originating in the central nervous system.

Secondary Myoclonus is seen in conditions in which there is central nervous system damage, which, in arachnoiditis, is likely to be related to the spinal cord, so would be termed spinal myoclonus (other types include peripheral myoclonus from an electrical impulse in a peripheral nerve).

Myoclonic jerks can be extremely debilitating as they interrupt normal posture and movement. The muscle spasms may be uncontrollable and may be both forceful and painful. They may be triggered by movement (?action' myoclonus), so may not be present when at rest or asleep.

There may also be sudden reduction in muscle contraction, which prevents normal movement: this is termed negative myoclonus (asterixis).

- Note: Drug-induced myoclonus: about 80 causal agents (toxins and drugs) including:
Tricyclic antidepressants e.g. amitriptyline
- SSRIs e.g. Prozac
- Penicillin
- Morphine
- Hydromorphone (an opiate related to morphine)
- Phenytoin
- Midazolam
- Pseudoephedrine (available in some over-the-counter common cold preparations)

Cramps: Sudden involuntary painful muscle contractions. Most often, cramps occur following voluntary contractions (e.g. after exercise), and occasionally during rest or sleep.

They usually involve single muscles rather than groups. Cramps may be seen in healthy people, usually in the calf muscle.

In patients with neurological disorders, cramps may occur in other muscles and may be associated with partial denervation or other neuromuscular conditions, as well as in hypothyroidism (under active thyroid gland) electrolyte disturbances (metabolic abnormalities affecting salts in the blood).

Nocturnal leg cramps are a common problem in arachnoiditis. (See also above under central pain).

Muscle spasms and cramps similar to the Painful tonic spasms (PTS) seen in MS may be violent and painful. Muscle fasciculations are usually painless and transient.

Muscle shortening is an important factor in neuropathic pain, and is caused by muscle spasm and contracture. Muscle shortening produces pain by pulling on tendons, straining them as well as distressing joints they move.

Muscle shortening also increases joint ?wear and tear' and contributes to degenerative changes such as tendonitis, and osteoarthritis.

A number of patients complain of symptoms suggestive of Restless Legs Syndrome, with nocturnal unpleasant sensations in the legs, accompanied by motor restlessness. Diagnostic criteria as defined by the Restless Legs Study Group are:

- desire to move the extremities, often associated with paraesthesias/dysaesthesias*
- motor restlessness
- worsening of symptoms at rest with at least some relief by activity
- worsening of symptoms in the evening or at night.

RLS may be primary or secondary to diseases or drugs.

Systemic diseases associated with RLS include: diabetes, rheumatoid arthritis, spinal cord and

cauda equina damage, radiculopathies (nerve root damage: as in arachnoiditis), thoracic spinal lesions, complete spinal cord injury and neuropathy.

Medications that may exacerbate or trigger RLS include: Paroxetine (an antidepressant), Mianserin, Phenytoin, caffeine, alcohol and nicotine.

Other problems with muscle spasms include: Less commonly there may be trouble swallowing, sometimes due to oesophageal muscle spasms.

Foot drop:

In some arachnoiditis patients who have scarring at L4/5 or L5/S1 (the spinal level at which the innervation for the common peroneal nerve arises) the muscles in the top part of the ankle become too weak to hold the foot at a 90 degree angle which means that as the foot is lifted, it drops down and tends to drag along the floor, which can cause tripping and falling, especially on uneven ground.

Sensory loss may make this problem more troublesome. Patients with this problem may try to overcome it by walking with the affected leg swung out with the knee straight and the weight on the other leg, leaning away from the affected side in order to swing the foot off the ground.

This can cause postural problems and put strain on the spine and legs. Commonly, this can lead to sore, swollen knees.

Risk factors for falls:

- Muscle weakness
- Sensory loss
- Poor balance
- Impaired vision: including wrong prescription glasses!
- Low bone density
- Medication

- Stiff joints
- Sensory ataxia

Obviously, many of these factors are pertinent in arachnoiditis patients.