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3 WEEKS AS A MEDICAL STUDENT IN THE MIDLANDS CENTRE FOR SPINAL INJURIES

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Third year medical student, I arrived at the Robert Jones & Agnes Hunt hospital on the 22nd of May. I spent 18 days in the spinal injuries department. Doctor El Masri and all the staff took great care of me, and as I had not done any clinical attachment in this kind of department before, I had everything to learn.

Some parts of this report are done with the help of articles and books:

- ABC of Spinal Cord Injury
- W.S El Masry and D.J.Short : Current concepts :spinal injuries and rehabilitation
- A Biyani MS, W S El Masri: Post traumatic syringomyelia : a review of literature (Paraplegia,1994)
- W S El Masri, A Biyani :Incidence, Management, and outcome of post traumatic syringomyelia (Journal of neurology, 1996)
- Y Folman and Wagih El Masri : Spinal Cord Injury :prognostic indicators (Injury,1989)

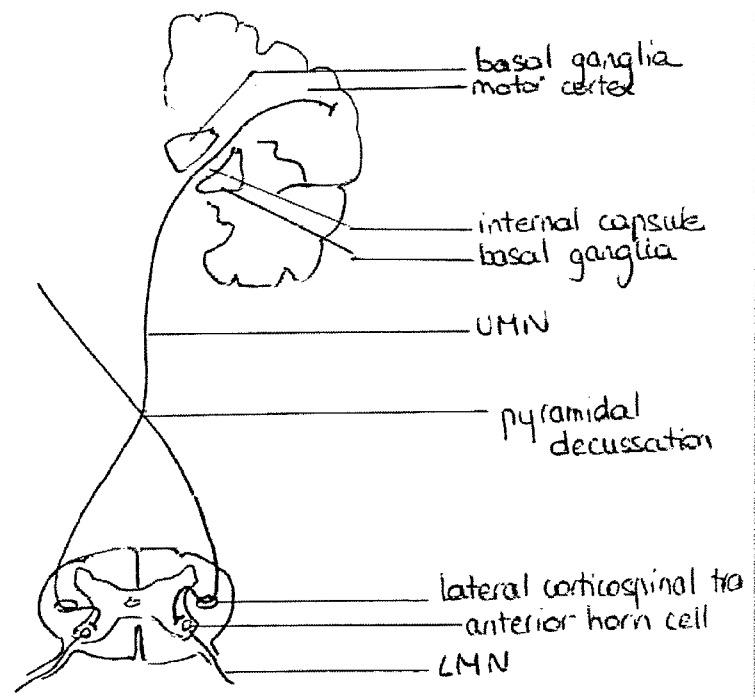
I. Minimal knowledge about neurology and spinal cord

As I arrived here I had not done any clinical neurology before, I had only learnt the neuroanatomy at university. So before understanding anything about spinal injuries, I had to review some things:

- The anatomy of the spinal cord
- The topography of the dermatoms
- The innervation of the muscles

Then I have learnt how to examine the spinal cord functions clinically, by testing the muscle power, the sensations including vibration & position senses, and reflexes.

I have also learnt how to make the difference between an upper motor neurone (UMN) lesion and a lower motor neuron (LMN) lesion.



KEY POINTS		
	LMN	UMN
Wasting	present (neurogenic wasting)	disuse atrophy only
Fasciculations	may be present	absent
Tone	normal or decreased (flaccidity)	increased (spasticity)
Posture	-	drift of outstretched arm (eyes shut)
Power	Focal weakness e.g. distribution of individual nerves or roots	movement-based pyramidal distribution
Tendon reflexes	depressed or absent	brisk
Clonus	absent	may be present
Plantar response	downgoing or absent	upgoing (positive Babinski)
Superficial abdominal responses	present	may be absent
Gait	may be high-stepping	spastic, scissoring, circumduction

II. Follow-up of patients since their arrival

A. The major causes of spinal injuries

Most of the patients I saw on the ward had had a road traffic accident, but some had fallen down stairs, or had had a sport accident. According to a study made at Stoke Mandeville hospital between March 1951 and August 1968:

Out of 682 patients the causes of spinal injuries were as follows:

-RTA : 340 (49.85%) with 182 (26.69%) car accidents and 113 (16.57%) motorbike accidents

-Aeroplane accidents: 8 (1.17%)

-Work related accidents: 181 (26.54%)

-Domestic accidents: 72 (10.56%) (Most of these two types of accidents were due to fall down stairs)

-Sport injuries: 71 (10.42%)

-Assault: 8 (1.17%)

-Attempted suicide: 2 (0.29%)

The highest occurrence was in the age group between 15-24 years.

B. First examination of the patient

Before arriving in this hospital, patients have to be haemodynamically and respiratory stable, because there is no intensive care unit. They must not be on or need ventilation, and other major injuries were dealt with.

Indeed, as far as injuries of the upper cervical spine are concerned, they are initially associated with acute respiratory failure, so prompt appropriate treatment is important, including ventilation if necessary.

So first of all, the doctor who looks after the patient has to make sure that there is neither haemothorax, pneumothorax nor other organ damage.

First he has to inspect the body of the patient, looking for scars or haematomas...

Then he has to feel the abdomen.

And he has to examine heart and chest.

Then he makes a first neurological examination of the patient.

If the patient has been injured in a motorbike accident, there can be brachial plexus injury as well.

C. Surgery or conservative management?

In some cases surgery is indicated e.g. ligamentous injury with gross instability.

-Mentally ill patient

-Severe instability with significant translation at the fracture site

-Pain and deformity can also lead to late surgery.

But in most cases, patients are given the choice between conservative management and surgical treatment, so doctors have to tell them the advantages and drawbacks of both solutions. I have noticed during these 3 weeks that conservative management seems to be less risky for the patient than surgery. If it is not well made, surgery can lead to complications for the spinal cord like hypoxia, hypotension, or sepsis that are potentially harmful to the spinal cord.

As far as pain is concerned, during my 3 week stay in the spinal injuries department, I have noticed that very few patients that are treated conservatively in the ward had mechanical pain after, whereas I had read in books that pain was common after spinal injuries, mechanical pain or neurogenic pain resulting of the absence of nociceptor activation.

The only patient with neurogenic pain I saw out of about 30 patients was called

He is a 29year old man, who had a RTA on the 21/05/89, which resulted in a L1/L2 fracture dislocation. He was L1 complete. He had surgery on the 22/05/89, but metal had to be removed on August 1989 because of dehiscence of the spinal wound. Since then he has had severe burning pain in the legs.

D. Conservative management

According to doctor El Masri, only about 15% of the spinal injured patients arriving in this hospital are treated surgically. Other patients have conservative management. They have 6 weeks of bedrest (with skeletal traction for fractures of the cervical spine), and then 6 weeks of rehabilitation with a cervical collar for cervical fractures, and with or without a brace support for thoracic and lumbar fractures.



Fig. 2.17 Mincrva plaster. It affords good fixation of the whole cervical spine.

The purpose of the conservative management is to keep all the body functions optimum, so to treat both the spinal fracture and the multisystem dysfunction. As a matter of fact, 3 factors influence the neurological outcome after a spinal cord injury:

- Biomechanical instability
- Physiological instability
- Disruption of the blood-brain barrier

The physiological instability makes the spinal cord vulnerable to non-mechanical damage from complications outside the spinal canal, so these complications have to be avoided.

What's more, factors, which contribute to the decline of paraplegic and tetraplegic patients, are inter-related. The following diagram shows the 'vicious circle' consequent upon spinal cord injury.

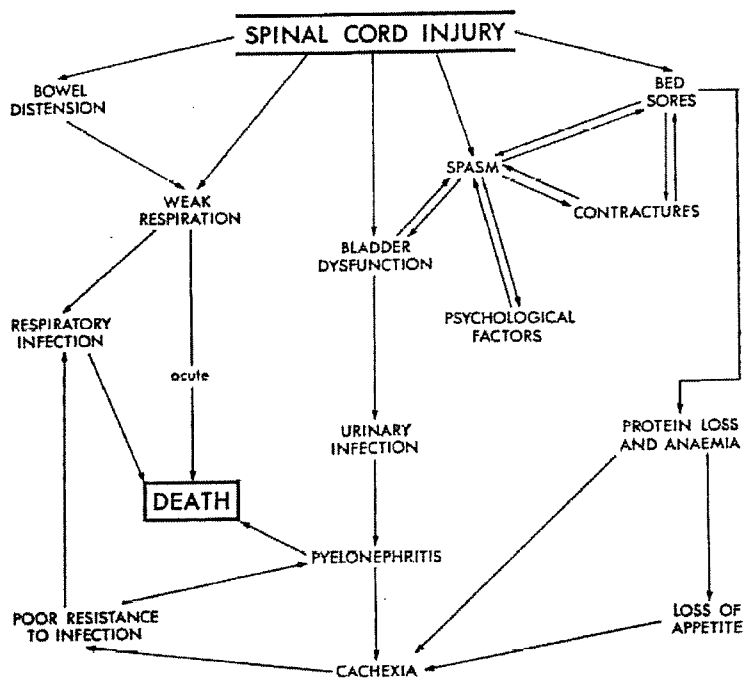
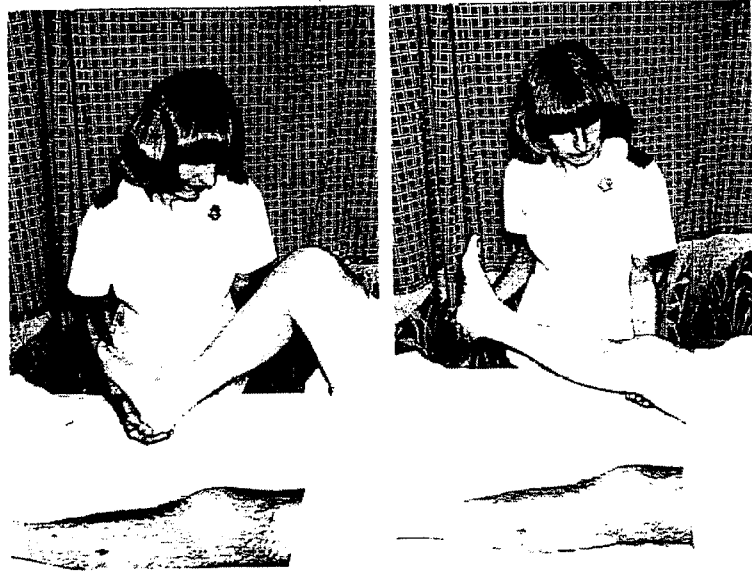


Fig. 3.9 The 'vicious circles' consequent upon spinal cord injury.

1. Physiotherapy

Paralysed limbs are moved passively each day to maintain a full range of movement. So in the morning, the physiotherapists go on the ward to stretch the patients' muscles, and in the afternoon patients go to the Physio. Department to use appropriate machines. But because of loss of sensation, joints and soft tissues are vulnerable to overstretching, so great care must be taken not to cause trauma.



Passive movements to a patient's leg. Good support must be given to the paralysed joints and a full range of movement achieved.

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Indeed, UMN lesions are associated with characteristic patterns of weakness: there is a 'pyramidal distribution' of weakness in the limbs. This means that there is a greater weakness of extensors than flexors in the upper limbs and of flexors than extensors in the lower limbs. This is very important, especially for tetraplegic patients, because they spontaneously tend to flex their elbow, and can develop contractures, a contracture can be a result of immobilisation, spasticity, or muscle imbalance between opposing muscle groups.

For patients with tetraplaegia or high-level paraplegia, abdominal and intercostal muscles may be paralysed, so patients are unable to cough effectively. Besides, a paradoxical respiration may be observed on these patients. Assisted coughing is necessary then to avoid chest infections.

Physiotherapists also have a role after the period of bedrest, when the patient has to stand up for the first time. Indeed, they have to check the right perfusion of the spinal cord, by measuring the blood pressure and

checking the muscles power and sensibility for increasing degrees of stand-up. This test is called 'tilt table study'.



Left: Tetraplegic patient standing on tilt table. Straps support patient's chest, lower trunk, and knees. Table is operated by therapist, the fully upright position being achieved gradually. Right: Oswestry standing frame enables paraplegic patient to stand by providing support through suitably placed padded straps at toes and heels, knees, and gluteal region. Uprights and two further straps allow a tetraplegic patient to stand in the frame by supporting the trunk.

2. Skin care

Many patients are admitted in the hospital because of pressure sores. The commonest sites are over the ischial tuberosities, the greater trochanter, and sacrum. They are due to sensory loss in these areas, to trophic changes of the skin, which result in ischaemia. If they are near a joint, they can lead to a septic arthritis.

Prevention is made by turning the patient two hourly and keeping the skin clean and dry.

If an established sore is present, any slough is excised.

I saw on the ward a young patient, who had a sacral sore. He had a diving accident in Nigeria in December 1999. He was laid down on his back for about 13 hours, after injury with tetraplegia, without being turned. So he developed 2 pressure sores, one on the back of the head, and the other one over the sacrum, which was about 5cm deep; he had surgery as he arrived in Oswestry for this sore. Here are some pictures taken on arrival.

-Avoiding excessive use of opiate analgesics.

Then the training programme depends on whether the bowel empties reflexly or flaccid, and on what level of self-care the patient is likely to achieve.

4. Prevention of urinary tract infections

I noticed during my stay in this hospital that doctors were always asking the patients about their bladder management. It seems to be for several reasons. First, doctors always ask the patients if they feel their bladder fullness, to know if they recover any sensation in this territory. But they are also interested in the bladder because of the problems brought to the patient by incontinence, and because as the bladder sometimes doesn't completely empty, it can cause severe urinary tract infections that are very dangerous for the patient when it reaches the kidneys.

Moreover, in 1917 Thomson-Walker stated that almost half of the patients within spinal cord injury died of urinary sepsis within 2 months. Since then bladder management has improved, but urinary tract infections are still the main cause of morbidity.

a- Sphincter dysfunction

There are two categories of neurogenic bladder dysfunction:

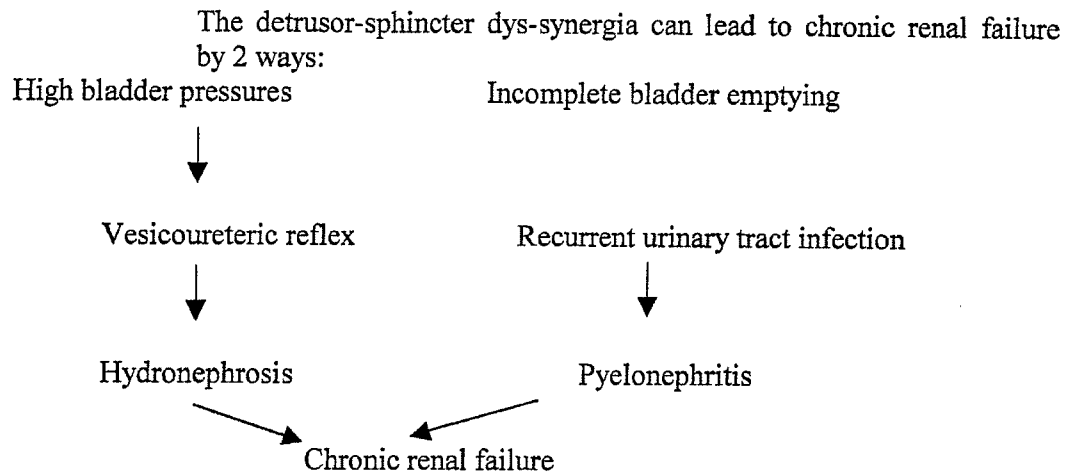
-Damage to the equivalent of the LMN for the bladder (S2,S3,S4 parasympathetic fibres in the conus or in the cauda equina) interrupts the normal reflex arc : the bladder fills but is unable to empty properly, and then becomes distended and palpable.

-Damage to the equivalent of the UMN for the bladder (lesion higher in the spinal cord) result in loss of supraspinal inhibition. The muscle wall of the bladder becomes increasingly irritable: it is detrusor instability. It makes patients become incontinent.

Actually, with high spinal cord lesions, patients may develop satisfactory reflex bladder emptying, provided cognitive function and the lower cord and cauda equina are intact, and the bladder wall has not been damaged by recurrent infection and excessive distension.

So in the first few weeks, the aim is the prevention of overdistention of the bladder, by intermittent urethral catheterisation. Any bacterial infection must also be avoided, because some bacteria, like Proteus, increase the incidence of calculi formation. Cultures of urine are regularly made for this purpose.

Then most of the patients develop detrusor hyperreflexia, due to loss of inhibition of reflex emptying. Their treatment consists of anticholinergic drugs, like oxybutinin, and / or self intermittent catheterisation. If urodynamics study shows that tapping of suprapubic area induces a detrusor contraction, this method can be used coupled with condom drainage and with or without a sphincterotomy. Actually, self intermittent catheterisation is likely to be the method of choice for long term bladder management, as long term results as far as incidence of infection, development of calculi, and renal function are concerned are excellent compared with other methods of bladder management.



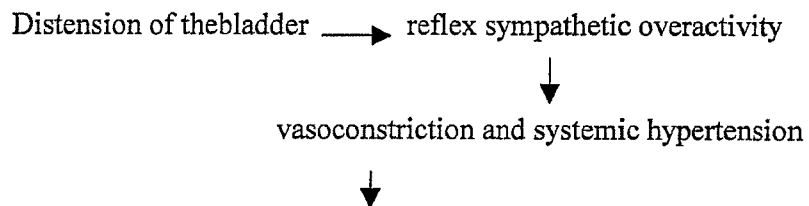
So there should be a long term prevention of urinary tract infections:

- High fluid intake if possible
- Ensure effective bladder emptying

If the patient suffers from recurrent urinary tract infection, the urine should be acidified by taking vitamin C, which prevents bacteria from growing.

c- Autonomic dysreflexia

Sometimes, in cervical cord injuries above the sympathetic outflow, there can be another bladder complication called autonomic dysreflexia:



- pounding headache
- profuse sweating
- flushing or blotchiness of the skin above the level of lesion
- without prompt treatment : risk of intracranial haemorrhage

Let's take another time the example of ... This C6 complete patient has had several times episodes of autonomic dysreflexia. The first one was in 1975, about one year after the accident: he had retention of urine, with headaches and sweats. He had another episode 2 months later, treated with Probanthine, and another one in 1999, when his blood pressure reached 230/120.

5. Problems with sexual function

For men, erectile impotence may be treated with penile injection of papaverine or prostaglandins. Some patients prefer mechanical vacuum devices, or new oral drugs (Viagra).

For women, the main problem is spasticity, the legs fixed in flexion and adduction. The treatment for them consists in antispasticity measures.

Actually, spasticity is an important problem for the patients. The drug commonly used is Baclofen, but the problem is that it increases weakness. For severe spasticity, intrathecal Baclofen can be used or botulinum toxin injections.

6. Goal-setting meetings

All the staff, including physiotherapists, nurse, psychologists, doctors, the patient and sometimes his parents or wife/husband meet and discuss about the progress the patient has done, about the next goals to reach and targets. This is a good way of motivating the patient.

III. Follow up of patients after hospitalisation

A. The outpatient clinic

After their first hospitalisation, patients are seen once or twice a year in the outpatient clinic. First, they fill in a form with a nurse. They are asked about:

- Pain. They have to describe it, its site, type (neurogenic or nocigenic pain), if they have any pain in the back or at the site of the fracture.
- Skin
- Bladder management
- Bowel management
- Sexual function
- Autonomic dysreflexia
- Independence in daily living
- Communication
- Ambulation
- Social circumstances

Then they are examined by a doctor, who tests muscle power, pain and touch sensation, reflexes...etc. This exam enables doctors to detect any clinical sign of syringomyelia

B. Syringomyelia

Syringomyelia is a severe disease that can be life threatening if it extends to the brainstem, but early clinical diagnosis confirmed by MRI and early treatment can revert or minimise the potentially devastating effects of PTS.

The incidence of post traumatic syringomyelia (PTS) confirmed radiologically is 0.3 to 3.2%.

It is twice as common in patients with complete injuries. The interval between spinal cord injury and PTS is variable; ranging from 2 months to several years, and it occurs after both surgical treatment and conservative management.

Its aetiopathogenesis is not well understood. The cavity forms by liquefaction of the canal tissue or haematoma at the site of the spinal cord injury. This cavitation is most frequently initiated at the level of the fracture, in the grey matter between the dorsal horns and posterior columns. The cavity can break down and communicate with the central canal. Syrinx usually extends superiorly rather than inferiorly.

The symptoms are:

- PAIN at or above the site of the fracture that may radiate to the neck and the upper limbs. This pain is increasing when straining, coughing and sneezing.
- DISSOCIATED SENSORY LOSS between pain and proprioception. The deficit is unilateral or bilateral.
- Increased MOTOR WEAKNESS. There is an ascent of the sensory level and a loss of deep tendon reflexes.

Surgical treatment is recommended for patients with PTS involving cervical cord, because of the risk of respiratory failure, and for those with progressive PTS with neurological deterioration.

Surgery has good results: the pain is relieved, and there is an improvement in motor weakness.

IV. Prognosis

A. Frankel's classification

According to the neurological status of the patient on admission and subsequent days and weeks, the prognosis varies from one patient to the other.

We distinguish:

- Frankel A: patients with no motor or sensory function
- Frankel B: patients with incomplete sensibility but without any motor function
- Frankel C: patients with incomplete sensibility and with useless motor function
- Frankel D: patients with incomplete sensibility and with useful motor function
- Frankel E: patient with normal sensation and muscle power.

B. Practical results

A retrospective study was made in 1988 in the Midlands Centre Of Spinal Injuries including 170 adult patients selected randomly in the outpatient clinic. The study was limited to C4-D10 level. None of the patients of this series was operated on.

The following observations could be made :

- 65% of patients with only sensory sparing recovered useful motor function (B--D).
- 86% of Frankel C patients on admission became D on the last follow-up examination.
- The higher the functional grade on admission the greater the prospect of full recovery
 - B--E: 13%
 - C--E: 60%
 - D--E: 75%
- condition of one patient deteriorated due to post traumatic syringomyelia.

The best prognosis of recovery of sensory motor functions can be predicted in patients with motor sparing as small as muscle flicker, indicated that the corticospinal tract is not completely destroyed. Patients presenting with sensory sparing of their spinothalamic modality could also recover full mobility. The reason for this is the anatomical proximity of the spinothalamic and corticospinal tracts in the lateral column.

As a conclusion, I would say that my stay in the Midlands centre for spinal injuries was very interesting, I learnt a lot of things about the conservative management. But now I think I should spend the same period of time in a surgical centre to compare both methods, their own advantages and drawbacks.