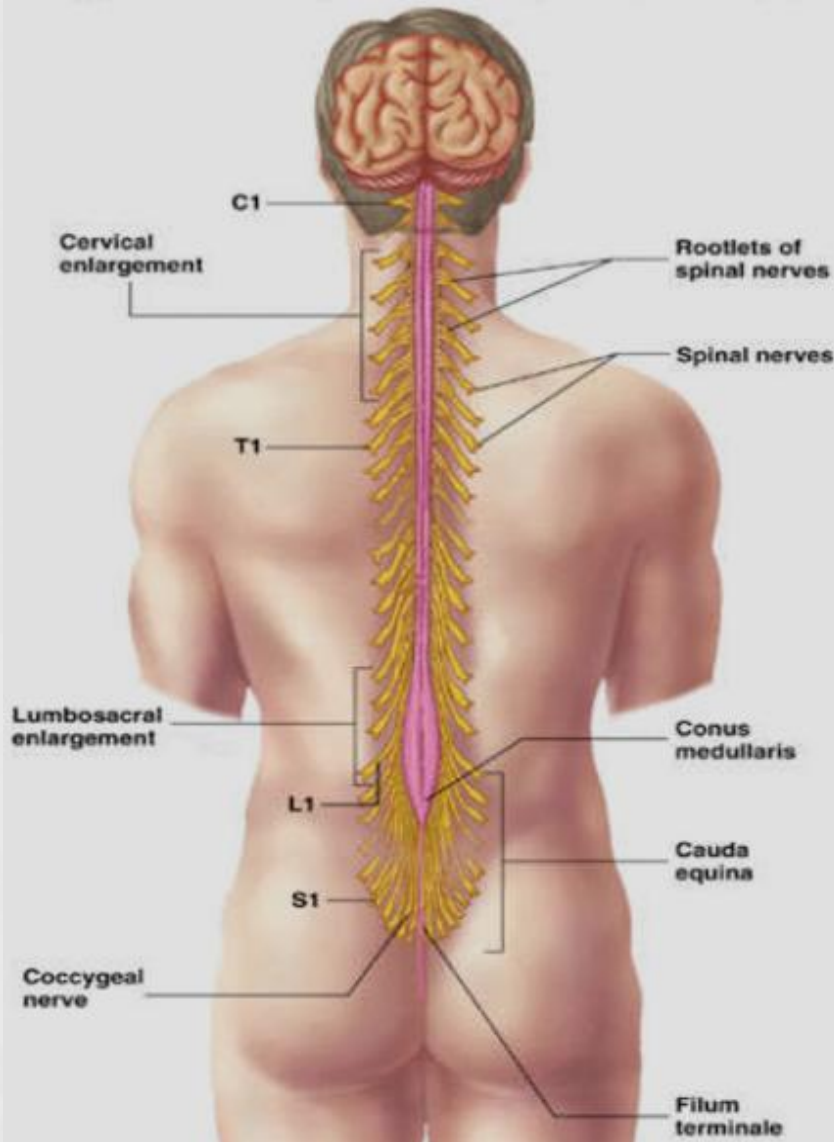


척수 손상 (Spinal Cord Injury)

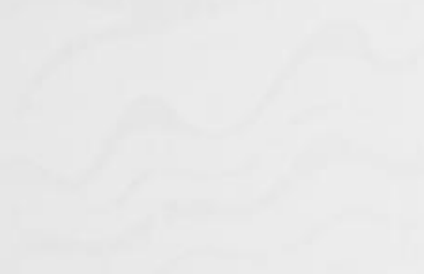


Spinal Cord



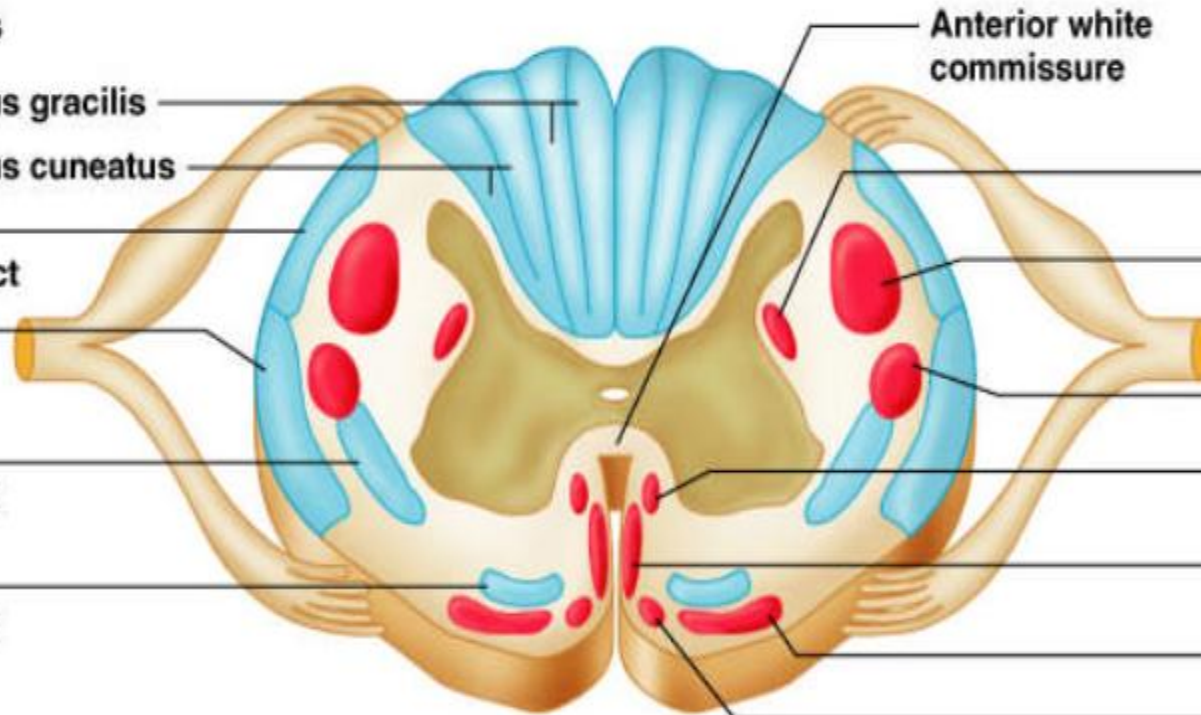
- Runs through the vertebral canal
- foramen magnum ~ L2
- Cervical–Thoracic–Lumbar–Sacral–Coccygeal
- 31 pairs of spinal nerve : mixed nerve
- Cervical enlargement : upper limbs
Lumbar enlargement : lower limbs
- Conus medullaris : L1 ~ L2
- Cauda equina : origin of spinal nerves extending inferiorly from conus medullaris

White Matter: Pathway Generalizations



Ascending tracts

- Dorsal white column
 - Fasciculus gracilis
 - Fasciculus cuneatus
- Posterior spinocerebellar tract
- Anterior spinocerebellar tract
- Lateral spinothalamic tract
- Anterior spinothalamic tract



Anterior white commissure

Descending tracts

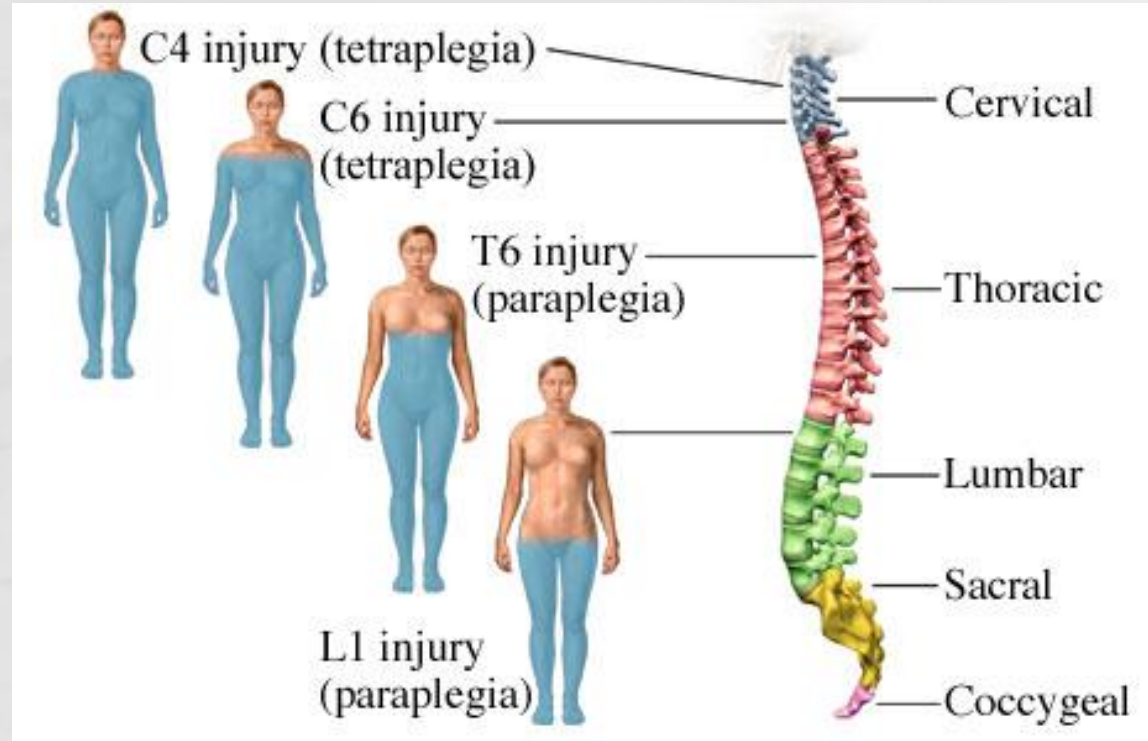
- Lateral reticulospinal tract
- Lateral corticospinal tract
- Rubrospinal tract
- Medial reticulospinal tract
- Anterior corticospinal tract
- Vestibulospinal tract
- Tectospinal tract

Key:

- Descending tracts
- Ascending tracts

특징

- 미국 : 사망원인 4위
- 원인
 - 교통사고 : 24- 56%
 - 추락사고 : 24-46%
 - 스포츠 손상 : 2-4%
- 남 > 여
- 15~24세가 50% 이상



Complete and Incomplete

- Complete
 - complete loss of motor and sensory function below the level of the traumatic lesion
- Incomplete
 - variable neurological findings with partial loss of sensory and/or motor function below the lesion
 - ✓ Central Cord Syndrome
 - ✓ Brown-Sequard Syndrome
 - ✓ Anterior Spinal Cord Syndrome

Type of Spinal Cord Injury

- ASIA Classification

- A : No motor & sensory
- B : Sensory only
- C : Motor < III
- D : Useful motor (More than half M/P III)
- E : Normal

Patient Name _____

Examiner Name _____ Date/Time of Exam _____



STANDARD NEUROLOGICAL CLASSIFICATION OF SPINAL CORD INJURY



MOTOR

KEY MUSCLES
(scoring on reverse side)

	R	L	
C5	<input type="checkbox"/>	<input type="checkbox"/>	Elbow flexors
C6	<input type="checkbox"/>	<input type="checkbox"/>	Wrist extensors
C7	<input type="checkbox"/>	<input type="checkbox"/>	Elbow extensors
C8	<input type="checkbox"/>	<input type="checkbox"/>	Finger flexors (distal phalanx of middle finger)
T1	<input type="checkbox"/>	<input type="checkbox"/>	Finger abductors (little finger)

UPPER LIMB TOTAL + =
(MAXIMUM) (25) (25) (50)

Comments:

L2	<input type="checkbox"/>	<input type="checkbox"/>	Hip flexors
L3	<input type="checkbox"/>	<input type="checkbox"/>	Knee extensors
L4	<input type="checkbox"/>	<input type="checkbox"/>	Ankle dorsiflexors
L5	<input type="checkbox"/>	<input type="checkbox"/>	Long toe extensors
S1	<input type="checkbox"/>	<input type="checkbox"/>	Ankle plantar flexors

Voluntary anal contraction (Yes/No)

LOWER LIMB TOTAL + =
(MAXIMUM) (25) (25) (50)

	LIGHT TOUCH		PIN PRICK	
	R	L	R	L
C2				
C3				
C4				
C5				
C6				
C7				
C8				
T1				
T2				
T3				
T4				
T5				
T6				
T7				
T8				
T9				
T10				
T11				
T12				
L1				
L2				
L3				
L4				
L5				
S1				
S2				
S3				
S4-5				

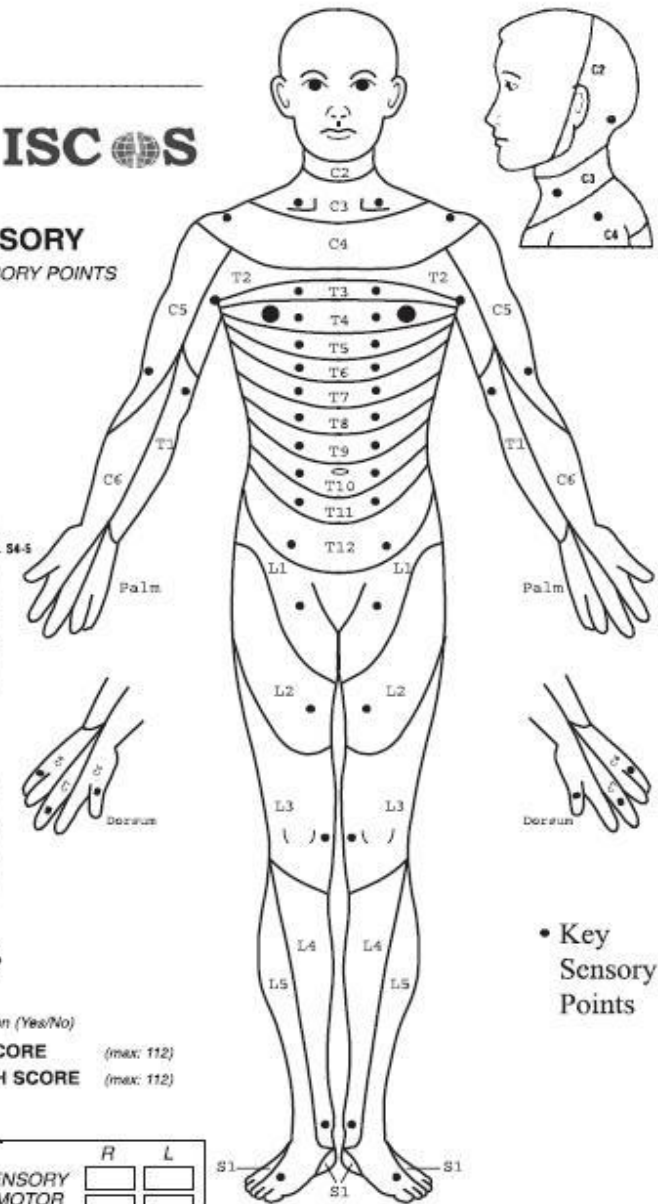
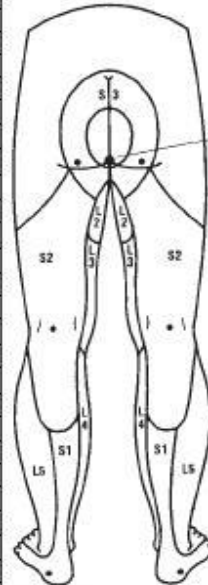
TOTALS { + = } + =
(MAXIMUM) (56) (56) (56) (56)

Any anal sensation (Yes/No)
 PIN PRICK SCORE (max: 112)
 LIGHT TOUCH SCORE (max: 112)

SENSORY

KEY SENSORY POINTS

0 = absent
1 = impaired
2 = normal
NT = not testable



• Key Sensory Points

NEUROLOGICAL LEVEL <small>The most caudal segment with normal function.</small>	SENSORY	R	L	COMPLETE OR INCOMPLETE? <input type="checkbox"/> <small>Incomplete - Any sensory or motor function in S4-S5</small>	ZONE OF PARTIAL PRESERVATION <input type="checkbox"/> <small>Caudal extent of partially innervated segments</small>	SENSORY	R	L
	MOTOR	<input type="checkbox"/>	<input type="checkbox"/>			MOTOR	<input type="checkbox"/>	<input type="checkbox"/>
ASIA IMPAIRMENT SCALE <input type="checkbox"/>								

Spinal Cord Paralysis Levels

C1-C3

- All daily functions must be totally assisted
- Breathing is dependant on a ventilator
- Motorised wheelchair controlled by chin movements is required

C4

- Same as C1-C3 except breathing can be done without a ventilator

C5

- elbow flexion
- Electric wheelchair, or manual for short distances

C6

- Wrist extension
- Assistance needed for dressing, and transitions from bed to chair and car may also need assistance

C7-C8

- All hand movements
- Ability to dress, eat, drive, do transfers, and do upper body washes

T1-T4 (paraplegia)

- Normal communication skills
- Help may only be needed for heavy household work or loading wheelchair into car

T5-T9

- Manual wheelchair for everyday living
- Independent for personal care

T10-L1

- Partial paralysis of lower body

L2-S5

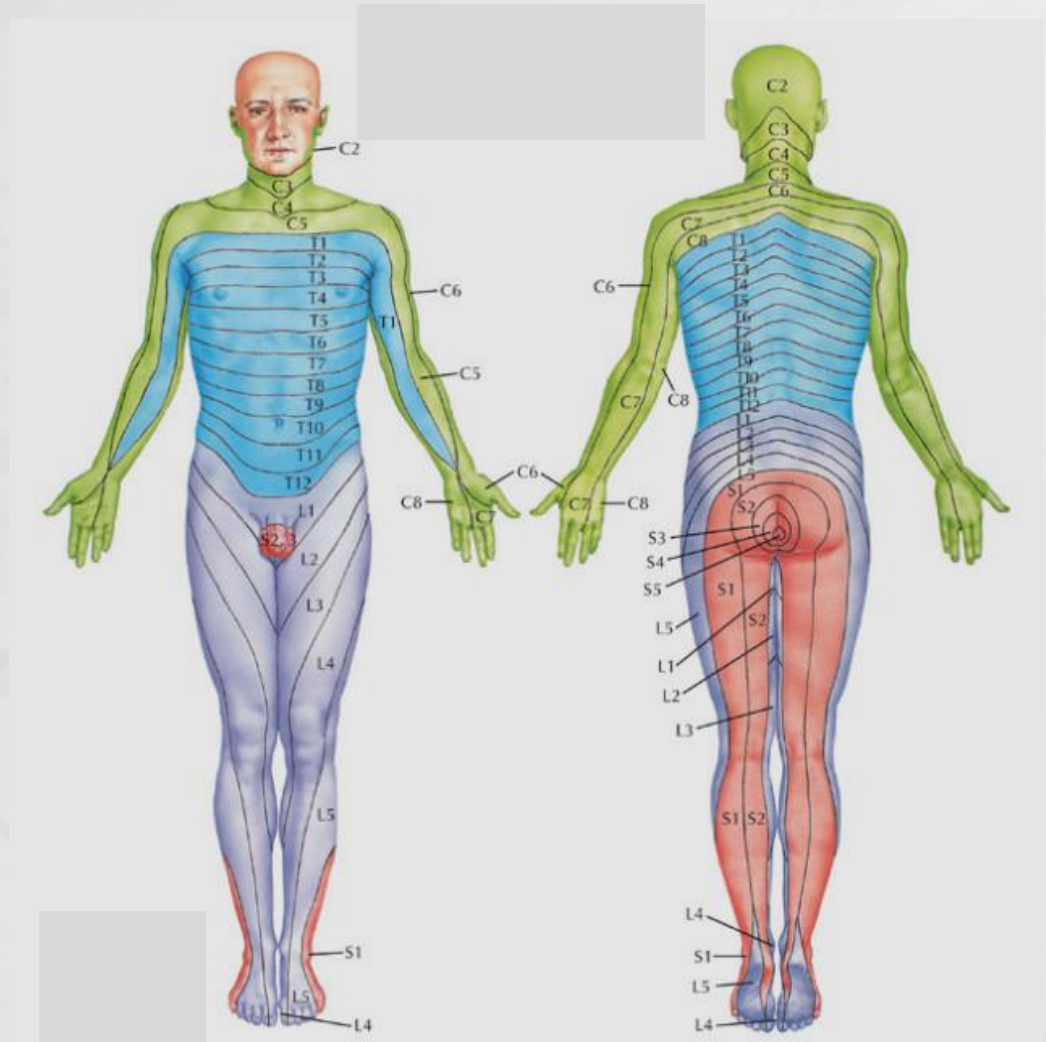
- Some knee, hip and foot movements with possible slow difficult walking with assistance or aids
- Only heavy home maintenance and hard cleaning will need assistance

Evaluation

- History
- Motor & Sensory & Deep tendon reflex
- Muscle Spasticity
- ROM
- Functional activity
- Skin
- Respiratory ability
- Assist aid
- Environment
- Others : Edema, Pain

Motor & Sensory

- ▶C5 - Elbow Flexor
- ▶C6 - Wrist Extensor
- ▶C7 - Elbow Extensor
- ▶C8 - Finger Flexor
- ▶T1 - Finger Abductor
- ▶L2 - Hip Flexor
- ▶L3 - Knee Extensor
- ▶L4 - Ankle Dorsiflexor
- ▶L5 - Long Toe Extensor
- ▶S1 - Ankle Plantar Flexor



Functional Activity

- Mat & bed ability

- ✓ Rolling
- ✓ Come to sit
- ✓ Sitting balance
- ✓ Mobility

- Transfer

- ✓ Mat ↔ W/C
- ✓ Bed ↔ W/C
- ✓ Floor ↔ W/C

Functional Activity

- Wheel Chair

- ✓ Propelling
- ✓ Slope
- ✓ Wheelie

- Gait

- ✓ [P-bar](#)
- ✓ Walker
- ✓ [Crutch](#)

- ADL

- ✓ MBI, FIM



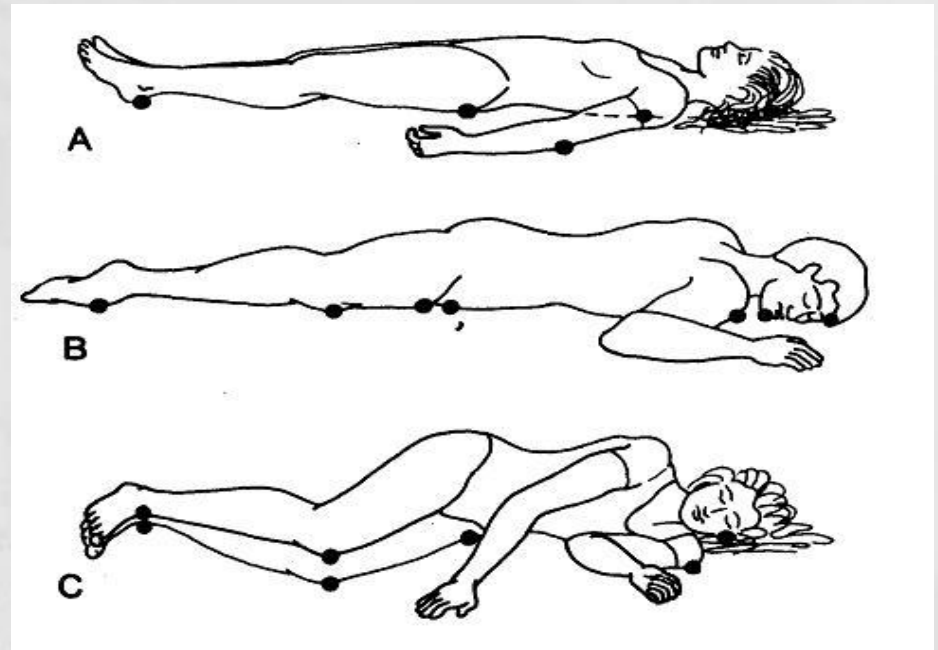
Sore

• 욕창의 단계

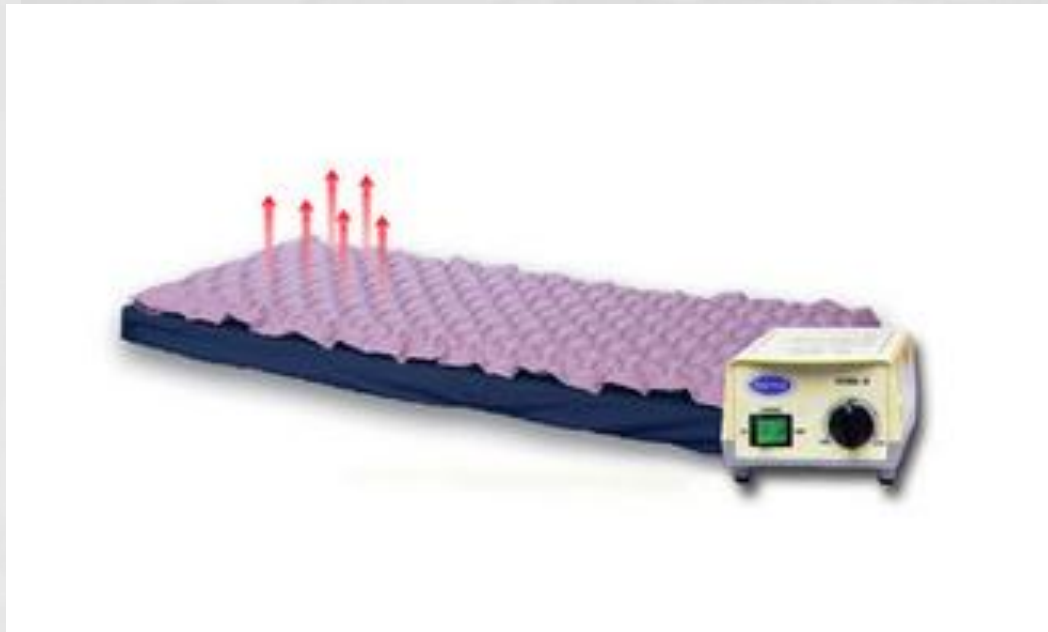
- ✓ 1 단계 : 분홍색 혹은 푸른색, 누르면 색깔이 일시적으로 없어지며 딱딱하고 열감. 마사지로 진행을 예방
- ✓ 2 단계 : 피부가 갈라지고 물집이 생김. 생리식염수로 세척 후 소독
- ✓ 3 단계 : 괴사조직 제거제 사용 또는 외과적으로 괴사조직을 제거
- ✓ 4 단계 : 골(bone)가 근육(muscle)까지 괴사

• 호발 부위 - 뼈 돌출 부위

- ✓ Occiput, Spinal column, Scapular, Olecranon, Sacrum, Greater trochanter, Wrist, Knee, Malleolus, Heel







손상수준	폐관리	아침 신변 처리	식사	용모단정히 하기	착탈의	목욕	침대위 기거
C3-C4	기침의 완 전보조	완전의존	적절한 용구 로 가능	완전의존	완전의존	완전의존	완전의존
C5	보조에 의 한 기침	특정자조장 구로 자립	특정섭식장 구로 자립	특정자조장 구로 자립	상의보조, 하의의존	완전의존	보조
C6	앉은자세 자립	자조장구로 자립	기구로 자립	기구로 자 립	상의자립 하의보조	기구로 자립	기구로 자립
C7	위와 같음	자립	자립	기구로 자 립	기구로 자 립가능성	자립	자립
C8-T1	위와 같음	자립	자립	자립	자립	자립	자립
T2-T10	T2-6 위와 같음 T6-10자립	자립	자립	자립	자립	자립	자립
T11-L2		자립	자립	자립	자립	자립	자립
L3-S3		자립	자립	자립	자립	자립	자립

손상수준	압력제거	휠체어 옮 겨타기	휠체어 주행 조작	보행	사지장구	수송	커뮤니케 이션
C3-C4	수동에서는 의존	완전의존	공기압, 턱제 어는 가능	적용없음	BFO	완전의존	특별기구
C5	대부분 보 조	Transfer board	전동휠체어 로 자립	적용없음	위와 같음	위와 같 음	위와 같 음
C6	자립	자립	플라스틱코 팅 악륜	적용없음	손목관절 작동식기구	특별개조 차 자립	기구로 자립
C7	자립	자립	자립	적용없음	필요없음	특별개조 차 자립	자립
C8-T1	자립	자립	자립	적용없음	필요없음	특별개조 차 자립	자립
T2-T10	자립	자립	자립	자립	KAFO, crutch	위와 같 음	자립
T11-L2	자립	자립	자립	자립	KAFO, crutch	위와 같 음	자립
L3-S3	자립	자립	자립	자립	KAFO, crutch, T-cane	위와 같 음	자립