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Case Report

A Patient with Symptoms Caused by Electric Shock Treated with Traditional Korean Medicine



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ABSTRACT

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This case report describes a 60-year-old female patient diagnosed with intercostal neuropathy and vertebral compression fractures which occurred following an electric shock injury. The patient received acupuncture, pharmacopuncture, and herbal medicine administration between February 10th, 2020 and April 25th, 2020. The pain level in the thoracic and left intercostal areas was assessed using the Numerical Rating Scale. The Self-report of the Leeds Assessment of Neuropathic Symptoms and Signs Pain Scale were used to diagnose neuropathic pain. The Neuropathic-Pain -Scale was used to evaluate the degree of neuropathic symptoms. The Oswestry Disability Index and the European Quality of Life-5 Dimensions were used to assess quality of life scales and functional disorder. Following combined Korean medicine treatment, the patient exhibited reduced levels of pain and significant improvement in functional disorder symptoms and quality of life.

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Introduction

An electric shock injury is a physiological and chemical reaction caused when an electric current passes through the human body, resulting in various kinds of damages. Electric shock injury includes direct damage to the central or peripheral nerves and tissues, burns induced by resistance of internal tissue, and mechanical damage followed by muscle contraction [1]. Strong contractions of the muscles that occur during electric shock injury can cause fractures. The most common are humeral head fractures, but thoracic compression fractures have also been reported [2]. Peripheral nerve damage occurs in about 15% of low-voltage electric shock injury. Neuropathic symptoms tend to coincide with the electric shock site [3].

Electric shock injury cannot be predicted in advance, so retrospective reviews are the main method of research and the number of patients is not high [4]. For this reason, there are not many articles on electric shock injury. Traditional Korean medicine

has only 1 case report of treatment for a headache following an electric shock injury [5].

This case report shows significant improvement after applying combined Korean medicine treatment (CKMT) to a patient who suffered left intercostal neuropathy and vertebral compression fractures following an electric shock injury. This study was exempt from IRB deliberations (IRB no: DJDSKH-20-E-13-1).

Case Report

Patient

Lee OO (female, 60 years old).

Principal complaints

Thoracic pain, left intercostal pain, gait disturbances.

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Onset and cause

February 8th, 2020, the patient suffered an electric shock when her back touched a concentric plug while sitting in a sauna. She did not fall but lost consciousness after the electric shock.

Past history

The patient had been taking medication since 2019, following a diagnosis of hypertension and osteoporosis.

Present status

The patient did not receive electrocardiography, blood tests or X-ray scans in the emergency room of Dunsan Korean Medicine

Hospital of the Daejeon University on February 8th, 2020. Her symptoms did not improve with analgesics (oral or injection), and the patient was admitted to the Dunsan Korean Medicine Hospital of the Daejeon University for treatment between February 10th, 2020 and April 25th, 2020.

Physical examination

When hospitalized at the Dunsan Korean Medicine Hospital of the Daejeon University, she was unable to stand or walk due to severe pain, making it impossible to measure range of motion and to perform physical examinations.

Blood tests

Erythrocyte Sedimentation Rate was elevated above normal (41 mm/hour) and procalcitonin was lower than normal (0.14 %). Other tests, including liver function test, complete blood count, and urinalysis all showed normal values.

Radiology findings

X-ray

February 11th, 2020, thoracic-spine AP: mild scoliosis of thoracolumbar spine and diffuse osteoporosis of the thoracolumbar spine. At the time of admission, she was unable to lie on her side because of severe pain, therefore only an AP image was taken. February 11th, 2020, rib posterioranterior view: no definite rib fracture findings (Fig. 1).

Computerized tomography (CT)

March 3rd, 2020, enhanced chest CT: subacute compression fracture T4-T6 (Fig. 2).

Magnetic resonance imaging (MRI)

March 3rd, 2020, T-spine MRI STIR image: subacute compression fracture T4-T6 (Fig. 2).

Treatment methods

Acupuncture

She received acupuncture twice a day, each morning and afternoon. Acupuncture was performed with 0.25 × 40 mm sterilized disposable stainless steel DongBangchim needles (Dongbang Medical Co., Ltd., Boryeong, Korea), which were left in place for 15 minutes. In the mornings, acupuncture treatment (AT) was conducted at the proximal regions, and in the afternoons AT was conducted at the distal regions. In the proximal region, AT was mainly performed at the following acupoints: BL13, BL14, BL15, BL16, BL17, BL42, BL43, BL44, BL45 and BL46 on both sides of the thoracic vertebrae; LR14, SP21, GB22 and GB23 of the left intercostal area, and at the BL40, BL60, BL62, GB34, GB39, SI3, ST36 and TE3 in the distal region (Fig. 3) [6].

Pharmacopuncture

Pharmacopuncture treatment was performed daily in the mornings. She was treated twice a week with soyeom pharmacopuncture (Korean-Pharmacopuncture-Research-Institute), ouhyul pharmacopuncture (Korean-Pharmacopuncture-Research-Institute), and hominis-placenta pharmacopuncture (Korean-Pharmacopuncture-Research-Institute), depending upon the symptoms. Bee-venom pharmacopuncture (Korean-Pharmacopuncture-Research-Institute) was performed once a week. Soyeom, ouhyul, and hominis-placenta were injected at the

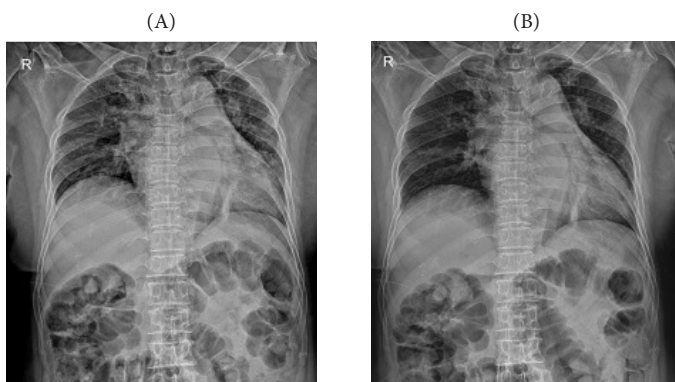


Fig. 1. X-ray on 2020.02.11. (A) Rib PA (B) T-SPINE AP.

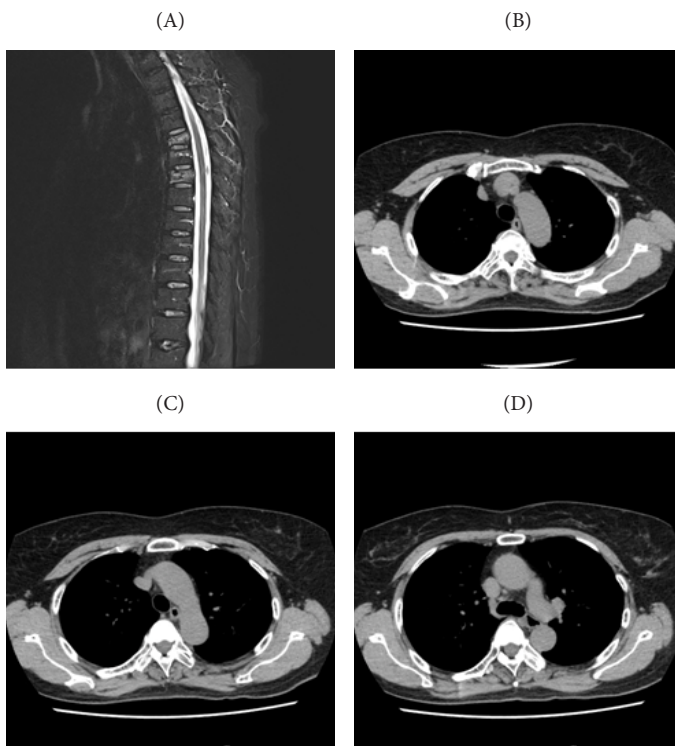


Fig. 2. T-spine MRI & CT on 2020.03.03. (A) T-spine MR STIR, (B) T4 CT, (C) T5 CT, (D) T6 CT. CT, computerized tomography; MRI, magnetic resonance imaging.

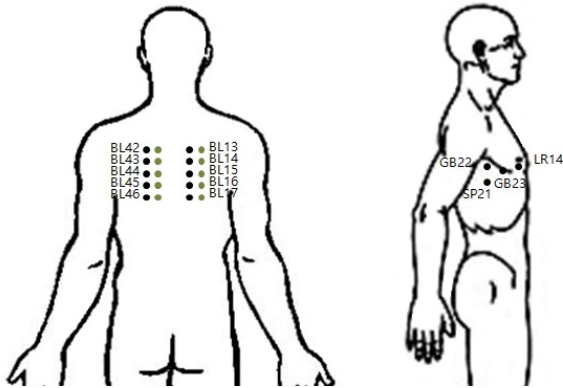


Fig. 3. Acupuncture points.

acupoints, the same as AT on both sides of the thoracic vertebrae, using a total of 2 mL, 0.1 mL per acupoint, with 13 mm × 30-gauge needles [6]. Bee-venom pharmacopuncture was refined 99.9% pure melittin 0.10 mg/mL. Bee-venom pharmacopuncture was explained to the patient prior to the procedure and she gave informed consent. In addition, a bee-venom allergy test was

performed on the skin to ensure that the patient had no side effects to bee-venom treatment. Bee-venom pharmacopuncture was conducted subcutaneously at the acupoints LR14, SP21, GB22, GB23 and BL26 in the left intercostal area, with a total of 1 mL, 0.2 mL per acupoint, using a 13 mm × 30-gauge needle. [6].

Herbal medicine

Herbal medicine treatment including lijintang-gami (LJTGM), gamigunggi-tang (GMGGT), guibitang-gami (GBTGM), and tongshun-san (TSS) was administered. The patient took herbal medicine (120 mL per each pack) 3 times daily, 1 hour after each meal. LJTGM was administered with TSS to reduce pain in the thoracic and left intercostal area. GMGGT was administered to facilitate the recovery of thoracic vertebral fractures. GBTGM was also used to help the healing of thoracic vertebral fractures, improve neuropathic symptoms, and insomnia. Table 1 shows the duration of use and the descriptive details of the LJTGM and GMGGT prescriptions. Table 2 shows the duration of use and the description detail of the GBTGM and TSS prescriptions.

Evaluation

The Self-report of the Leeds Assessment of Neuropathic Symptoms and Signs Pain Scale (S-LANSS) [7] (Appendix A) was

Table 1. Duration of Use, Herbal Composition of LJTGM and GMGGT, and Daily Dosage.

	LJTGM (g) (02/15/2020-03/03/2020)		GMGGT (g) (03/04/2020-03/09/2020)
Angelicae gigantis radix	12	Angelicae gigantis radix	20
Cinnamomi ramulus	8	Cnidii rhizoma	20
Lonicerae flos	8	Cervi cornus colla	10
Cynanchi atrati radix	8	Carthami fructus	10
Poria sclerotium	8	Ginseng radix	8
Amomi fructus	4	Astragali radix	8
Arecae semen	4	Lycii fructus	8
Linderae radix	4	Cuscutae semen	4
Citri unshius pericarpium immaturus	4	Dendrobii herba	4
Moutan radicis cortex	4	Codonopsis pilosulae radix	3
Atractylodis rhizoma alba	4	Dipsaci radix	4
Pinelliae tuber	4		
Cyperii rhizoma	4		
Citri unshius pericarpium	4		
Sinapis albae semen	4		
Glycyrrhizae radix	3		
Aucklandiae radix	3		
Carthami flos	1		
Sappan lignum	1		

LJTGM, lijintang-gami; GMGGT, gamigunggi-tang.

Table 2. Duration of Use, Herbal Compositions of GBTGM and TSS, and Daily Dosage.

	GBTGM (g) (03/10/2020-03/23/2020, 04/10/2020-04/25/2020)		TSS (g) (04/24/2020-04/09/2020)
Eucommiae cortex	12	Carthami fructus	6
Lycii fructus	12	Paeniae radix rubra	4
Psoraleae semen	12	Angelicae dahuricae radix	4
Angelicae gigantis radix	6	Aurantii fructus immaturus	4
Zizyphi semen	6	Linderae radix	4
Astragali radix	6	Glycyrrhizae radix	4
Poria Sclertum cum Pini Radix	6	Akebiae caulis	4
Longan arillus	6	Cynanchi wilfordii radix	4
Ginseng radix	6	Foeniculi fructus	4
Atractylodis rhizoma alba	6	Angelicae gigantis radix	4
Polygalae radix	6		
Aucklandiae radix	3		
Glycyrrhizae radix	2		

GBTGM, guibitang-gami; TSS, tongshun-san.

Table 3. The Changes of NPS, ODI, EQ-5D Score Before and After the Treatment.

Score	Before	21 d	42 d	After 76 d
NPS	50	36	14	12
ODI	49	38	33	30
EQ-5D-5L	0.01	0.256	0.721	0.721

EQ-5D-5L, 5-level European Quality of life 5 Dimension; NPS, Neuropathic Pain Scale; ODI, Oswestry Disability Index.

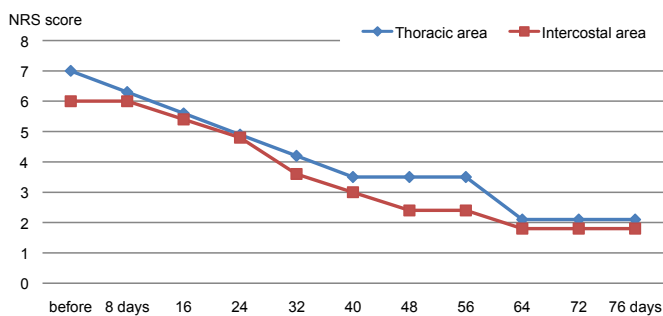


Fig. 4. The Change of NRS Score Before and After The treatment
NRS, numerical rating scale.

used as a tool to diagnose neuropathic symptoms. If the S-LANSS questionnaire gave a score higher than 12 points, it was assumed that the neuropathic mechanism was associated with the patient's symptoms. The patient's S-LANSS questionnaire score, conducted on February 10th, 2020, was 19 points, showing her left intercostal area symptoms to be diagnostic of neuropathy. The Numerical Rating Scale (NRS) [8] scores were evaluated and compared at 7 a.m. daily beginning on February 10th, 2020, and continued for 76 days. The Neuropathic-Pain-Scale (NPS) [9] (Appendix B), the Oswestry Disability Index (ODI) [10] (Appendix C), and the European Quality of Life-5 Dimensions (EQ-5D) [11] (Appendix D) were also compared and evaluated before AT on the first day of hospitalization, after 21 days, 42 days, and on discharge day. A Korean version of the S-LANSS, NPS, and ODI questionnaires [10] (whose reliability and validity studies had previously been verified) were used for evaluation. the EQ-5D-5L was calculated by applying the Korean preference weights for the Korean standard population status.

Progress

The patient showed a significant improvement in NRS, NPS, ODI, EQ-5D scores following treatment. Fig. 4 shows the improvement details of the NRS scores in both the thoracic area and left intercostal area. Table 3 shows the improvement of the NPS, ODI, EQ-5D scores. At the time of admission, the patient had been unable to walk because of severe pain in the left intercostal and thoracic areas, but after April 03rd, 2020, she was able to walk with reduced pain.

Discussion

CKMT was performed for 76 days on a patient who had suffered an electric shock injury which caused multiple compression fractures of the thoracic vertebrae and left intercostal neuropathy.

AT has been used therapeutically for various pain conditions such as lumbar sprain, fractures of the spine, and intercostal neuralgia [6]. The analgesic effect of acupuncture is generally explained in 3 ways. Firstly, axion reflexes and the activity of adenosine A1 receptors, occurring during AT, facilitate blood circulation into local areas and reduce pain. Secondly, AT suppresses pain signals by providing new afferent excitatory stimulation to the central nervous system that can only process a limited amount of information. Thirdly, AT suppresses systemic pain by stimulating the central nervous system to induce various endogenous opioid peptides [12]. This is the basis for applying AT to many pain conditions/diseases. In this case, considering that the patient's NRS and NPS score decreased after treatment, acupuncture is thought to have helped reduce pain.

Pharmacopuncture is a new treatment that combines the theory of acupuncture medicine and pharmacotherapy. Chemical stimulation through drugs, extracted from a specific herbal medicines, are used as an additional treatment to AT which delivers physical stimulation through meridians and acupoints. Clinically, pharmacopuncture has been used for various pain conditions/diseases such as neuropathic pain, compression fractures, and joint sprains [13]. In particular, soyeom, ouhyul, hominis-placenta and bee-venom pharmacopuncture have been used for vertebral compression fractures and neuropathic pain, which helped improve symptoms [14,15].

Herbal medicine was prescribed to relieve pain and improve side effects during treatment, such as sleep disorders, and anxiety [16,17]. However, various kinds of herbal medicines were also used in combination to improve the patients' discomfort. When treating similar cases in the future, we suggest the consistent administration of herbal medicine as a main modality.

This study has the limitation of being a single case report. Although conservative treatments of compression fractures take an average of about 3 months to resolve [18], however, her pain was reduced enough to allow her to walk following the CKMT after approximately 2 months, despite having had multiple compression fractures in 3 vertebrae.

Pain in the thoracic and left intercostal area, evaluated by NRS and NPS scores, showed improvement. In addition, functional disorder and quality of life showed improvement, as evaluated by ODI and EQ-5D. This suggests the possibility that CKMT is effective for the treatment of electric shock injury.

Conflicts of Interest

The authors have no conflicts of interest to declare.

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Appendix A.**S-LANSS**

1. In the area where you have pain, do you also have “pins and needles,” tingling or prickling sensations?
 - a) No – I don’t get these sensations (0)
 - b) YES – I get these sensations (5)

2. Does the painful area change color perhaps looks mottled or redder) when the pain is particularly bad?
 - a) No – The pain does not affect the color of my skins (0)
 - b) YES – I have noticed that the pain does make my skin look different from normal (5)

3. Does your pain make the affected skin abnormally sensitive to touch? Getting unpleasant sensation or pain when lightly stroking the skin might describe this
 - a) No – The pain does not make my skin in that area abnormally sensitive to touch (0)
 - b) YES – My skin in that area is particularly sensitive to touch (3)

4. Does your pain come to suddenly and in bursts for no apparent reason when you are completely still? Words like “electric shocks,” jumping and bursting might describe this
 - a) No – My pain doesn’t really feel like this (0)
 - b) YES – I get these sensations often (2)

5. In the area where you have pain, does your skin feel unusually hot like a burning pain?
 - a) No – I don’t have burning pain (0)
 - b) YES – I get burning pain often (1)

6. Gently rub the painful area with your index finger and then rub a non-painful area (for example, an area of skin further away or on the opposite side from the painful area).
How does this rub feel in the painful area?
 - a) No – The painful area feels no different from the non-painful area (0)
 - b) YES – I feel discomfort, like pin and needles, tingling or burning in the painful area that is different from the non-painful area (5)

7. Gently press on the painful area with your finger tip then gently press in the same way onto a non-painful area (the same non-painful area that you chose in the last question) How does this feel in the painful area?
 - a) The painful area does not feel different from the non-painful area (0)
 - b) I feel numbness or tenderness in the painful area that is different from the non-painful area (3)

Scoring: a score of 12 or more suggests pain of predominantly neuropathic origin

Appendix B.

Neuropathic Pain Scale

Please read the following questions and mark ✓ in the appropriate box

1. How strong is your pain?

No pain	1	2	3	4	5	6	7	8	9	10	The most severe pain imaginable
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2. How sharp is your pain?

No pain	1	2	3	4	5	6	7	8	9	10	The most severe sharp pain imaginable
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3. How much do you feel burning sensation in the pain area?

No pain	1	2	3	4	5	6	7	8	9	10	The most severe burning sensation imaginable
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4. How much do you feel dull sense in the pain area?

No pain	1	2	3	4	5	6	7	8	9	10	The most severe dull sense imaginable
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5. How much do you feel cold sensation in the pain area?

No pain	1	2	3	4	5	6	7	8	9	10	The most severe cold sensation imaginable
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6. How sensitive do you feel in the pain area?

No pain	1	2	3	4	5	6	7	8	9	10	The most severe sensitivity imaginable
---------	---	---	---	---	---	---	---	---	---	----	--

7. How much do you feel itch in the pain area?

No pain	1	2	3	4	5	6	7	8	9	10	The most severe itch imaginable
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8. How much do you feel discomfort in the pain area?

No pain	1	2	3	4	5	6	7	8	9	10	The most severe discomfort imaginable
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Appendix C.

Oswestry Disability Index

1. Pain Intensity

- I have no pain at the moment
- The pain is very mild at the moment
- The pain is moderate at the moment
- The pain is fairly severe at the moment
- The pain is very severe at the moment
- The pain is the worst imaginable at the moment

2. Personal care (washing, dressing etc.)

- I can look after myself normally without causing extra pain
- I can look after myself normally but it is very painful
- It is painful to look after myself and I am slow and careful
- I need some help but manage most of my personal care
- I need help every day in most aspects of self-care
- I do not get dressed, wash with difficulty and stay in bed

3. Lifting

- I can lift heavy weights without extra pain
- I can lift heavy weights but it gives extra pain
- Pain prevents me from lifting heavy weights off the floor but I can manage if they are conveniently positioned, e.g. on a table
- Pain prevents me from lifting heavy weights off the floor but I can manage light to medium weights if they are conveniently positioned
- I can lift only very light weights
- I cannot lift or carry anything at all

4. Walking

- Pain does not prevent me walking any distance
- Pain prevents me walking more than one mile
- Pain prevents me walking more than a quarter of a mile
- Pain prevents me walking more than 100 yards
- I can only walk using a stick or crutches
- I am in bed most of the time and have to crawl to the toilet

5. Sitting

- I can sit in any chair as long as I like
- I can sit in my favorite chair as long as I like
- Pain prevents me from sitting more than 1 hour
- Pain prevents me from sitting for more than half an hour
- Pain prevents me from sitting for more than 10 minutes
- Pain prevents me from sitting at all

6. Standing

- I can stand as long as I want without extra pain
- I can stand as long as I want but it gives me extra pain
- Pain prevents me from standing for more than 1 hour
- Pain prevents me from standing for more than half an hour
- Pain prevents me from standing for more than 10 minutes
- Pain prevents me from standing at all

7. Sleeping

- My sleep is never disturbed by pain
- My sleep is occasionally disturbed by pain
- Because of pain I have less than 6 hours of sleep
- Because of pain I have less than 4 hours of sleep
- Because of pain I have less than 2 hours of sleep
- Pain prevents me from sleeping at all

8. Sex life (if applicable)

- My sex life is normal and causes no extra pain
- My sex life is normal but causes some extra pain
- My sex life is nearly normal but is very painful
- My sex life is severely restricted by pain
- My sex life is nearly absent because of pain
- Pain prevents any sex life at all

9. Social life

- My social life is normal and causes me no extra pain
- My social life is normal but increases the degree of pain
- Pain has no significant effect on my social life apart from limiting my more energetic interests e.g. sport etc.
- Pain has restricted my social life and I do not go out as often
- Pain has restricted my social life to my home
- I have no social life because of pain

10. Travelling

- I can travel anywhere without pain
- I can travel anywhere but it gives extra pain
- Pain is bad but I manage journeys over two hours
- Pain restricts me to journeys of less than one hour
- Pain restricts me to short necessary journeys under 30 minutes
- Pain prevents me from travelling except to receive treatment

Appendix D.**European Quality of Life-5 Dimensions (EQ-5D)**

Under each heading, please tick the ONE that best describes your health TODAY.

1. MOBILITY

- 1) I have no problems in walking about
- 2) I have slight problems in walking about
- 3) I have moderate problems in walking about
- 4) I have severe problems in walking about
- 5) I am unable to walk about

2. SELF-CARE

- 1) I have no problems washing or dressing myself
- 2) I have slight problems washing or dressing myself
- 3) I have moderate problems washing or dressing myself
- 4) I have severe problems washing or dressing myself
- 5) I am unable to wash or dress myself

3. USUAL ACTIVITIES (e.g. work, study, housework, family, or leisure activities)

- 1) I have no problems doing my usual activities
- 2) I have slight problems doing my usual activities
- 3) I have moderate problems doing my usual activities
- 4) I have severe problems doing my usual activities
- 5) I am unable to do my usual activities

4. PAIN / DISCOMFORT

- 1) I have no pain or discomfort
- 2) I have slight pain or discomfort
- 3) I have moderate pain or discomfort
- 4) I have severe pain or discomfort
- 5) I have extreme pain or discomfort

5. ANXIETY / DEPRESSION

- 1) I am not anxious or depressed
- 2) I am slightly anxious or depressed
- 3) I am moderately anxious or depressed
- 4) I am severely anxious or depressed
- 5) I am extremely anxious or depressed