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Case Report

The Effect of Korean Medical Treatment on Suspected Diabetic Muscle Infarction (DMI)

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[Abstract]

Objectives : This study reports the clinical effects of Korean medical treatment on a patient with suspected diabetic muscle infarction (DMI).
Methods : A patient diagnosed with spinal stenosis was suspected of DMI. The patient was treated with acupuncture, bee-venom pharmacopuncture and gastrocnemius stretching. Symptoms were evaluated by verbal numeric rating scale (vNRS), Oswestry disability index (ODI) and Manchester foot pain and disability index (MFPDI).
Results : After approximately 5 weeks of Korean medical treatment, including 8 bee-venom treatments, vNRS, ODI, and MFPDI all decreased.
Conclusion : The results suggest that Korean medical treatment is effective for treating pain caused by DMI.

Key words :
Diabetic muscle infarction;
Bee Venom;
Korean medicine

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Ⅰ. Introduction

On October 2015, Statistics Korea announced healthcare payments status from 2010 to 2014, categorized by the Korean standard classification of disease (KCD). According to the statistics, Korean medical treatments for diseases of the musculoskeletal system and connective tissue steadily increased[1]. As population and healthcare payment increases, an accurate differential diagnosis is essential to gain trust for Korean medicine. Diabetic muscular infarction (DMI) is a rare disease found in patients with long-standing diabetes mellitus, usually found in the lower limb muscles[2]. In this case report, a patient diagnosed and treated with spinal stenosis was assumed to have diabetic muscular infarction. No reports of DMI were made in Korean medicine journals before, and as Korean medical doctors in clinical practice commonly encounter neurogenic diseases, we report this case to differentiate DMI from leg pain caused by neurogenic diseases.

Ⅱ. Case study

1. Patient

JeonOO, Male, 81 years.

2. Chief complaint

1) Lumbago
2) Unilateral skelalgia (right)
3) Calf and foot pain (right)

3. Onset

1) Lumbago : Since 1998.
2) Skelalgia, calf and foot pain : 2016.6.27.

4. Family history

None.

5. Past medical history

1) Hypertension : 18 years, PO-Med +.
2) Diabetes mellitus (DM) : 18 years, PO-Med +.
3) Renal cancer : 1998. Nephrectomy.
4) Benign prostatic hyperplasia : 2005. PO-Med +.
5) Irritable bowel syndrome : 5years, PO-Med +.
6) Insomnia : 3 years, PO-Med +.

6. Present illness

1) 1998. Lumbago onset d/t Rt. nephrectomy.
2) 2016.6.27.~2016.6.30. Rt. skelalgia and foot pain developed. L-spine MRI showed spinal stenosis. Epidural nerve block 2 times.
3) 2016.7.4.~2016.7.16. Admitted at OO medical center for 2 weeks. Lumbago and skelalgia relieved, Rt. calf and foot pain showed no change.
4) 2016.7.19.~2016.7.31. Admission at Samse Korean Medical Hospital.
5) 2016.8.1.~2016.8.20. Visited Samse Korean Medical Hospital 16 times until end of treatment.

7. Medications (Table 1)

8. Examinations

1) Clinical chemistry

(1) 2016.7.19. : Total protein 4.9 g/dL (normal range 6~8.5), glucose 132 mg/dL (normal

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Table 1. Medications

Ingredients Label	Dose	Medication Purpose
Diovan 160 mg	QD 1 T divide 1, 7 PM	Hypertension
Dexid 480 mg	QD 1 T divide 1, 7 AM	Diabetic neuropathy
Zemiglo 20 mg	QD 1 T divide 1, 8 AM	Diabetes mellitus
Diamicron MR 30 mg	QD 1 T divide 1, 8 AM	Diabetes mellitus
Celebrex 200 mg	BID 2 T divide 2, 8 AM 7 PM	Pain control
Opalmon	BID 2 T divide 2, 8 AM 7 PM	Pain control
Stilnox 10 mg	QD 1 T divide 1, HS	Insomnia
Irribow 5 μg	PRN 1 T divide 1	Irritable bowel syndrome
Smecta Suspension	PRN 1 P divide 1	Irritable bowel syndrome
Octiran 20 mg	PRN 1 T divide 1	Irritable bowel syndrome
Simecopan Soft Cap.	PRN 1 C divide 1	Irritable bowel syndrome
Domatil	PRN 1 T divide 1	Irritable bowel syndrome
Stimin	PRN 1 T divide 1	Irritable bowel syndrome
Betmiga PR 50 mg	QD 1 T divide 1, 7 PM	Benign prostatic hyperplasia
Thrupas ODT 8 mg	QD 1 T divide 1, 7 PM	Benign prostatic hyperplasia

QD : quaque die, T : tablet, MR: modified release, BID : bis in die, C : capsule, HS : hora sumni, PRN : as needed, P : pouch, PR : pro-longed release, ODT : oral disintegrating tablet.

range 70~120), HbA1c 6.7 % (normal range 4.4~6.4), BUN 24.9 mg/dL (normal range 6~20), creatinine 1.5 mg/dL (normal range 0.5~1.2), red blood cell count 3.21 × 10^6 /uL (normal range 4.2 × 10^6~6.5 × 10^6), hemoglobin 11.0 g/dL (normal range 13~17), hematocrite 31 % (normal range 39~52), platelet 143 × 10^3 /uL (normal range 150 × 10^3~450 × 10^3)

(2) 2016.7.27. : Uric acid 2.8 mg/dL (normal range 2.6~6), qualitative C-reactive protein (CRP) negative, erythrocyte sedimentation rate (ESR) 3 mm/hr (normal range 0~10), White blood cell count 5.0 × 10^3 /uL (normal range 3.5 × 10^3~10 × 10^3)

2) Radiology

(1) L-spine MRI (2016.6.27.) : L2-3, L4-5, L5-S1 stenosis (Fig. 1).

(2) Lower limb ultrasound (2016.7.27.) : No sign of deep vein thrombosis. Right medial gastrocnemius-soleus area calcification and small fluid collection (Fig. 2).

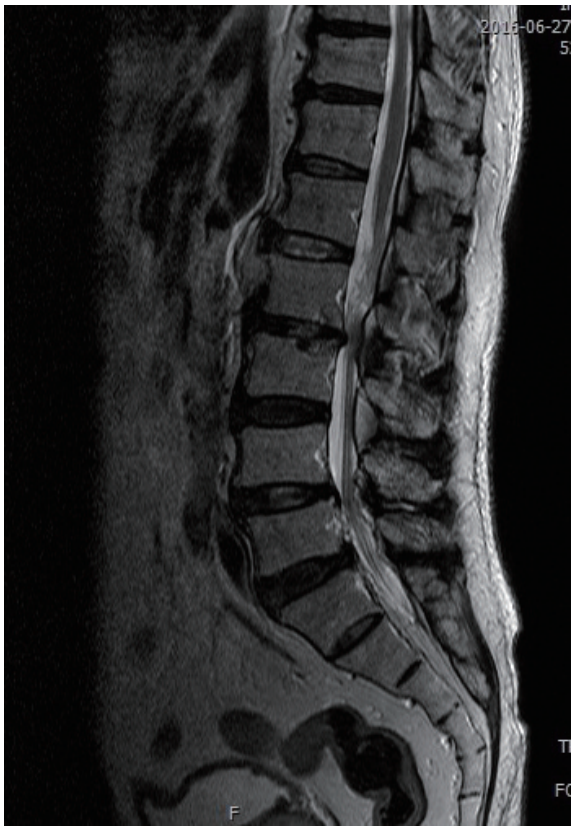

Fig. 1. L-spine magnetic resonance image

Sagittal plane T2 MRI image of L-spine showing L2-3, L4-5, L5-S1 stenosis.

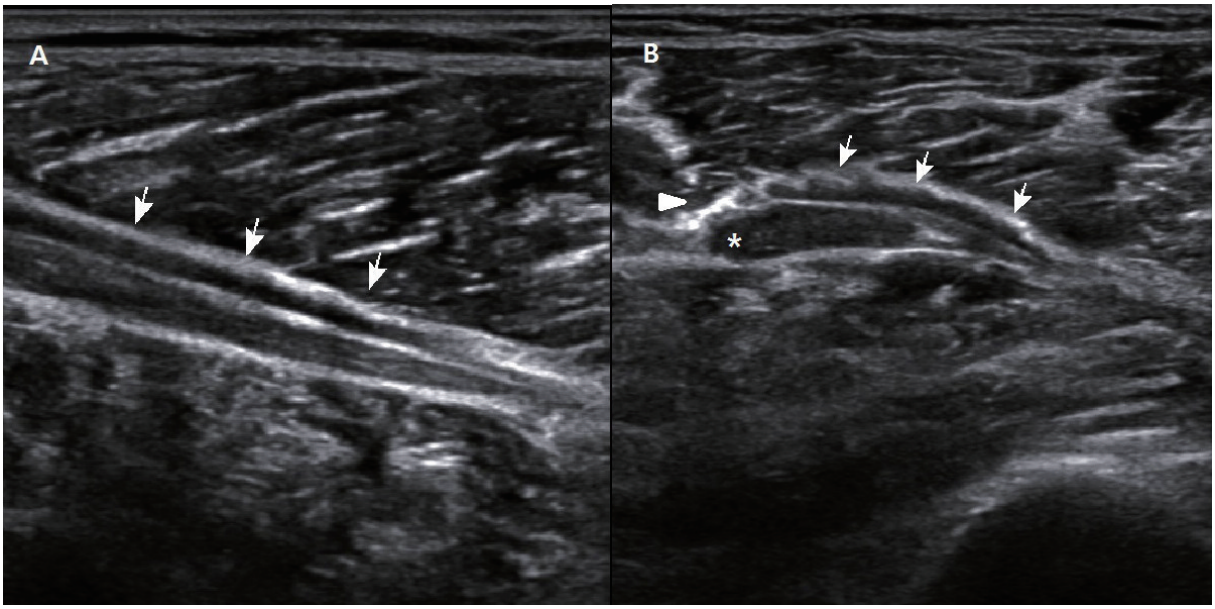

Fig. 2. Lower limb ultrasound

Longitudinal ultrasound image(A) shows hyperechoic focus (arrows) along right medial gastrocnemius-soleus area indicating calcification. Transverse image(B) show significant calcified region (arrowhead) and anechoic region (star) indicating fluid collection.

9. Treatments

1) Acupuncture & Pharmacopuncture

(1) Acupuncture

Acupuncture treatment was conducted 2 times a day at 9 AM, 3 PM during admission and once a day after discharge. Patient lying down in prone position, acupuncture was done with single-use 0.20 × 30 mm needles (DongBang Acupuncture Inc., Korea) at Hua-Tuo-Jia-Ji-Xue of lumbar spine and right WeiZhong (BL40), ChengShan (BL57), XuanZhong (GB39), TaiXi (KI3) for 15 minutes.

(2) Pharmacopuncture

For treatment of lumbago and skelalgia, we injected 2.0 cc Chukyu (spine-healing) pharmacopuncture (Korean Pharmacopuncture Institute, Korea) at 10 points of lumbar Hua-Tuo-Jia-Ji-Xue evenly divided by 0.2 cc on each point using two 31 gauge 1.0 cc disposable insulin syringes (Sungshim Medical Co., Korea) once every two days during admission and once every OPD treatment.

After testing for allergic reactions by skin test, 1.0 cc of bee-venom pharmacopuncture (Jaseng pharmacopuncture institute, BV2) was injected subcutaneously at the site of calcification evenly divided by 0.2 cc on each point using 31 gauge 1.0 cc disposable insulin syringe (Sungshim Medical Co., Korea) twice a week, with interval of 2 or 3 days, resulting in total 8 times of treatment.

2) Excercise Therapy

The patient was taught to perform gastrocnemius stretching. Placing both hands on the wall, the symptomatic leg was placed a step behind the asymptomatic leg. The patient was told to lean forward against the wall, bending front knee and holding the extension of the right leg until feeling tolerable stretch of the gastrocnemius muscle. Starting from 10 seconds gradually increasing up to 30 seconds each time, 10 repetitions were told to perform with 30 seconds of rest periods between each repetition[3].

10. Evaluation of symptoms

1) Verbal Numeric Rating Scale (vNRS)

The verbal numeric rating scale is widely used to objectify and quantify subjective pain. Patients are asked to answer about the severity of their pain from 0–10, with 0 being 'no pain' and 10 being 'the most intense pain imaginable'[4]. We asked the patient every day before treatment of each pain sections : lumbago, skelalgia, calf and foot pain using open questions, focused on the relation between pain and movement.

2) Oswestry Disability Index (ODI)

ODI was taken three times, at admission and discharge, and after three weeks of OPD treatment to measure results of the treatment. The ODI consists of ten sections : pain, personal care, lifting, walking, sitting, standing, sleeping, sex life, social life, and travelling. Respondents choose from one of six statements that describes best of their conditions. Each statement is scored 0~5, summed up and transformed to a percentage score, adjusted for missed sections. Possible score range is 0~100, a higher score indicating worse lumbar function[5]. Considering Korean social culture, 'sex life' item was excluded[6], and since the patient was taking one tablet of Stilnox 10 mg every day for insomnia, answers to 'sleeping' section of the questionnaire was also excluded from the final calculation.

3) Manchester Foot Pain and Disability Index (MFPDI) (Appendix 1)

Designed and developed by researchers at the University of Manchester, MFPDI can be used for various levels of disability associated with a specific foot or general medical condition. The questionnaire consists of 19 items that assess foot-related problems across four constructs : pain intensity (5 items), functional limitation (10 items), personal appearance (2 items) and limitation in work or leisure activities (2 items). Each item is answered by three point scale, 0~2 points in sequence : 'none of the time', 'on some days' or 'on most/every day(s)'. Each scored items are summed up, higher the score indicates more functional disability in the foot[7]. MFPDI was taken twice, first before bee-venom treatment started, and at the end of treatment.

11. Assessment & Result (Table 2)

1) 2016.07.19.~2016.07.26.

At admission, patient complained dull pain of sacrum to right hip (vNRS 6 at all times), skelalgia on lateral thigh and anterior, lateral side of lower leg (vNRS 6 at all times) with twinging pain from right medial calf to first metatarsophalangeal joint through medial side of foot arch (vNRS 7 at all times with increased pain after walking). The patient was not able to walk longer than 20 minutes or walk stairs and could not sit for 30 minutes without pain. The range of motion (ROM) of the lumbar spine and right knee was normal and dorsiflexion of right ankle with knee extension showed mild limitation. SLRT was 70/80. The bragard test was positive on right. ODI was 22.5 %.

After 1 week of treatment, lumbago was relieved to vNRS 4 at all times and skelalgia from 3 at rest and 4 at every lumbar movement while right foot pain remained alike at vNRS 7. Thus we did a full external examination and found a stiff lump with tenderness at patient's right medial calf sized about 4 centimeters in length and 0.5 centimeters in width. The foot pain spiked when the patient tried to extend the gastrocnemius muscle. The mass showed no swelling, warmth or redness. The patient showed no sign of generalized infection. MFPDI was 18 points.

2) 2016.7.27.~2016.7.30.

On 2016.07.27, right leg sonography was done by medical doctor in Samse Korean medical hospital. The result showed calcification and small fluid collection in medial gastrocnemius area, and observation was recommended. Patient had DM for 18 years and had mild diabetic peripheral neuropathy

Table 2. Treatment Progress and Results

	At Admission (2016.07.19)	After 1 week Admission (2016.07.26)	At Discharge (2016.07.30)	After 1 week OPD (2016.08.06)	After 2 weeks OPD (2016.08.13)	After 3 weeks OPD, end of treatment (2016.08.20)
Lumbago (vNRS)	6 (all times)	4 (all times)	3 (at rest) 5 (at movement)	3 (all times)	1 (at rest) 2 (after walking ≥ 1 hour)	1 (at rest) 1–2 (after walking ≥ 1 hour)
Skelalgia (vNRS)	6 (all times)	3 (at rest) 4 (at movement)	3 (all times)	1 (at rest) 2 (at movement)	0 (at rest) 2 (after walking ≥ 1 hour)	0 (at rest) 1 (after walking ≥ 1 hour)
Calf&foot pain (vNRS)	7 (all times)	7 (all times)	3 (at rest) 5 (at movement)	2 (at rest) 3 (after walking ≥1 hour)	0 (at rest) 1 (after walking ≥ 1 hour)	0 (at rest) 0 (after walking ≥ 1 hour)
Gastrocnemius Stretching	–	10 sec × 5 rep.	10 sec × 10 rep.	15 sec × 10 rep.	30 sec × 10 rep.	30 sec × 10 rep.
ODI	18(22.5 %)	–	11(13.75 %)	–	–	10(12.5 %)
MFPDI	–	18	–	–	–	12

vNRS : verbal numeric rating scale, ODI : Oswestry Disability Index, MFPDI : Manchester Foot Pain and Disability Index.

affecting his fingertips for 3 years. With no general conditions indicating infection and no history of trauma, we suspected the calcification may be DMI and suggested further evaluation of the lesion but the patient wished to continue on with conservative treatment.

The patient agreed on bee-venom treatment and was tested for allergic reactions. No allergic sign appeared. Also, we instructed the patient with gastrocnemius stretching, starting from 10 seconds per repetition.

From 2016.07.28, analgesics were discontinued due to the patients' IBS. Rebound of lumbago was observed during lumbar movements but showed gradual decrease at rest.

Due to financial reasons, the patient was discharged on 2016.07.30. At dismissal, vNRS of calf and foot pain reduced from 7 to 3 at rest, and 5 at all movements. The mass showed less tenderness. Lumbago was reduced by half (vNRS 6 to 3) at rest. The patient was able to sit for more than an hour, while walking was still difficult due to the calf pain. ODI showed improvement, 22.5 % to 13.75 %.

3) 2016.8.1.~2016.8.7.

After discharge, the patient attended OPD treatment 6 days in the first week. 3rd and 4th bee-venom treatment was done on 2016.8.2 and 2016.8.5. After 4th treatment, the patient showed improvement on walking as he started walking for an hour every day in the morning with bearable pain. Calf and foot pain was reduced to vNRS 2 at rest, and after walking for an hour pain increased to vNRS 3 lasting 2~3 hours. The mass softened, without tenderness. Gastrocnemius stretching time improved to 15 seconds each repetition.

4) 2016.8.8.~2016.8.20.

The patient attended OPD treatment 5 days a week. 5th to 8th bee-venom treatment was performed, on 9th, 12th, 16th, and 19th August. Lumbago decreased to vNRS 1 at rest, skelalgia during walking disappeared and showed vNRS 1 after walking more than 1 hour. Calf and foot pain were gone at rest, and even after walking for more than an hour pain did not occur. On 2016.8.13, the patient complained of one-time mild pain on the right medial calf while descending stairs. The pain

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did not reoccur afterwards. The mass kept softened, without tenderness. Gastrocnemius stretching time improved to 30 seconds each repetition. ODI and MFPDI improved to 12.5 % and 12 respectively.

Ⅲ. Discussion

First described by Angervall and Stener[8] in 1965, diabetic muscle infarction (DMI) also termed diabetic myonecrosis, is an uncommon complication of long-term poorly controlled diabetes mellitus (DM) with a poor disease progress and a high mortality rate[9]. Although DM is a very common disease, DMI is rare, as less than 200 cases were reported since it was first described[2].

DMI presents acute pain accompanied with a palpable tender mass, usually including local swelling. Its occurence is lopsided in muscles of the thigh (71.2~83.7 %) and less commonly in the calf (15.3~19.3 %), rarely involving an upper extremity[2,10]. DMI is likely to present in patients with a long prevalence of DM with complications due to poor glycemic control, including nephropathy, retinopathy and/or neuropathy[10]. The exact pathogenesis of DMI is not fully investigated, while spontaneous ischemic necrosis unrelated to atheroembolism or occlusion of major arteries is considered as one[2,10]. A systematic review in 2015[2] showed that there is no predominance of sex nor types of diabetes. The recurrence of DMI is frequently reported, up to 50 % cases on the contralateral side.

Differential diagnosis of DMI should be made, especially that long-standing DM patients are susceptible to various conditions. Deep vein thrombosis, infections such as cellulitis, pyomyositis, soft tissue tumors and pain from neurogenic factors should be considered in the differential diagnosis[9,10,12]. Treating DMI with supportive treatment including analgesics, rest, and physiotherapy will resolve the symptoms spontaneously, resolving time ranged from at least 4 weeks to more than 12 weeks, and frequent reccurence were reported[9,11]. A retrospective study of the disease in 2004[9] reports the recovery was shortest when antiplatelet drugs and NSAIDs were used. To prevent recurrence and other macrovascular diseases, small dose aspirin (80 mg per day) is used, while NSAIDs are often avoided by use as DM patients are at a high risk of acute kidney injury[12]. Diagnosis of DMI can be supported by MRI results showing increased T2 signals of the affected muscle and relatively isointensive or hypointensive imaging appears on T1 weighted images[10]. DMI could also be confirmed with muscle biopsy, but as biopsies can make recovery time longer or exacerbate the condition, a surgical biopsy should be carefully considered unless the symptoms are atypical with uncertain diagnosis[13].

In the current case, the patient had DM for 18 years with 3 years of peripheral neuropathy, showing clinical symptoms similar to typical symptoms of DMI already reported. The patient refused further evaluation including MRI which made us only to diagnose the case with probable DMI.

The patient being diagnosed with spinal stenosis, it made us misdiagnose the pain in the right calf and foot as accompanied pain from his neurogenic status. The patient was treated with Chuckyou (spine-healing) pharmacopuncture for his spinal stenosis, considering the research result of Lee et al.[14] which reported Chuckyou pharmacopuncture effective on lumbago and skelalgia. After a week of admission, lumbago relieved but the calf and foot pain showed no change even with analgesic medication combined. Thus, after conducting extra physical examinations, we found a stiff palpable mass in the patient's right medial calf. The mass showed tenderness with no redness or heat, and increase in pain by movement was observed. Laboratory findings were CRP negative, ESR 3 mm/hr, and uric acid 2.8 mg/dL, indicating no sign of inflammation nor gout. We could rule out cellulitis and pyomyositis as those conditions would show

signs of inflammation in lab results, and cellulitis also accompanies intense pain with focal heat and redness. Deep vein ultrasound was done to rule out deep vein thrombosis, and both leg blood vessels showed intact. Thus, we strongly suspected of DMI.

Bee-venom pharmacupuncture is widely used for various musculoskeletal, neuropathic and rare diseases[15]. Due to its effect of anti-inflammation, pain relief, immunoregulation, and promoting blood circulation[16], we selected bee-venom pharmacupuncture as treatment. After 2nd treatment, pain decreased significantly with less tenderness of the mass. After 4th bee-venom treatment, the mass softened and tenderness disappeared. During 5th to 8th treatments the patient showed gradient decrease in leg pain with softening of the mass. At 6th treatment, the mass was barely palpable. As the patient complained of a slight pain while descending stairs, additional two times of bee-venom treatment was performed.

In this case, it took 8 weeks for the pain to fully resolve from the onset (2016.6.27.). First 3 weeks analgesics and western medical treatment were done targeting spinal stenosis, during 4th week analgesics and Korean medical treatment for spinal stenosis were combined which resulted in decrease of lumbar pain. In following 4 weeks only Korean medical treatments were done targeting spinal stenosis and the suspected DMI lesion. We consider this case as a meaningful result of Korean medical treatment as reported DMI cases show 4 to 12 weeks of progress using analgesics and bed rest combined. At the last follow-up, one month after the end of treatment, the symptoms were not observed any recurrence.

This case report has limitations, as we could not impose on the patient with further evaluations as MRI or muscle biopsy to firmly diagnose DMI. However the clinical symptoms strongly projected toward DMI, and as until now no reports considering DMI has been made in journals of Korean Medicine, us authors report this as an alarming case of diagnosing pain of the leg in clinical practice.

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Appendix 1. The Manchester Foot Pain and Disability Index (MFPDI)

During the past month this has applied to me:			
	None of the time	On some days	On most/ every day(s)
I avoid walking outside at all			
I avoid walking long distances			
I don't walk in a normal way			
I walk slowly			
I have to stop and rest my feet			
I avoid hard or rough surfaces when possible			
I avoid standing for a long time			
I catch the bus or use the car more often			
I need help with housework/shopping			
I get irritable when my feet hurt			
I feel self-conscious about my feet			
I feel self-conscious about the shoes I have to wear			
I still do everything but with more pain and discomfort			
I have constant pain in my feet			
My feet are worse in the morning			
My feet are more painful in the evening			
I get shooting pains in my feet			
I am unable to carry out my previous work			
I no longer do all my previous activities (sport, dancing, hill walking etc.)			

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