

Korean Medical Therapy for Knee Pain after Anterior Cruciate Ligament Reconstruction

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Key words :

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[Abstract]

Objectives : The aim of this study was to report the effect of Korean medical therapy on pain and dysfunction after anterior cruciate ligament (ACL) reconstruction.

Methods : A 25-year-old man experienced severe pain after right ACL reconstruction surgery. He received Korean medical treatments such as acupuncture, herbal medicine, and physiotherapy from July 10, 2014 to August 2, 2014.

Results : After the treatments, his visual analogue scale scores generally decreased and the range of motion of the right knee improved from 0° to 90°. Furthermore, the Knee Injury and Osteoarthritis Outcome Score increased from 99 to 142.

Conclusion : The findings suggest that Korean medical treatments might be effectively used to treat pain and dysfunction after soft-tissue surgeries such as ACL reconstruction. Nevertheless, further research is warranted because of the limited sample size of this study.

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I. Introduction

The number of knee joint surgeries being performed has increased at a rapid pace. According to the National Health Insurance Service, 54,097 knee joint surgeries were performed in 2009, and this was more than double the number of surgeries (25,414) performed 4 years ago in 2005¹. This increase may be attributed to an increase in the number of degenerative osteoarthritis cases², the number of people playing sports, the elderly population, and the frequency of knee injuries.

The increase in the number of surgeries has also resulted in an increase in the number of Korean medicinal approaches for pain control and management³. However, only a few studies have investigated pain control and management after knee replacement surgery or soft-tissue reconstruction. Research on pain control after surgery has been lacking. In contrast, many studies have found that acupuncture is effective in controlling the pain caused by degenerative knee osteoarthritis⁴, moreover, conservative treatment has been proven effective for knee ligament injuries⁵.

In the case of reconstruction of soft tissues such as ligaments and the meniscus, the collagen arrangement is irregular during 3 to 6 weeks after the surgery. Moreover, the tensile strength of these structures is weakened to 6.8% of the original structures⁶. Therefore, pain control after surgery and functional care are crucial. Previous studies⁶ have shown that histological structures and blood vessels do not regain their original function until the first year after surgery, and the biological remodeling process may take from 9 months to 3 years or more. Thus, Korean medical treatment may be more effective to ensure proper knee function and to strengthen the weakened knee ligaments during the recovery period. We report a case of treatment based on Korean medicine that helped in pain control and functional improvement of the knee of a patient who complained of persistent pain after anterior cruciate ligament

(ACL) reconstruction. In addition, we review articles on the use of Korean medical therapy after soft-tissue injuries.

II. Case

1. Subject

A 25-year-old man who had right ACL complete tear was admitted at Dongguk university bundang Oriental Hospital from July 10, 2014 to August 2, 2014.

2. Chief Complaint

Difficulty performing flexion or extension of the right knee, pain and swelling – Right. ACL complete tear

3. Onset Date

June 5, 2014.

4. Past Medical and Social History

No anomaly

Occupation: Undergraduate

Smoking and alcohol use: None

5. Present Illness

The patient fell down, while playing soccer on , June 5, 2014. He underwent right knee plain radiography and MRI at Chungbuk National University Hospital. He was diagnosed as having right ACL complete tear, which necessitated surgical treatment. However, arthroscopic right ACL recon-

struction was performed at Dongguk university bundang Hospital on June 27, 2014. The patient was hospitalized for 7 days after the surgery. The knee pain worsened during recuperation after hospital discharge. Therefore, the patient sought Korean medical treatment, and he was admitted to the hospital through the departments of acupuncture and moxibustion.

6. First Medical Examination Results

Difficulty performing flexion or extension of the right knee, pain, and swelling

1) Location: redness and swelling

Severe edema, heat sensation when palpated on the right knee, and flare all over the right knee

2) Range of motion (ROM)

Active ROM flexion: 0°

Negative ROM (fixation of the thigh with both hands) flexion: 45°

3) Claudication

The patient experienced severe pain during orthostatic posture with a knee brace and could not walk independently.

4) Severity

Knee Injury and Osteoarthritis Outcome Score (KOOS), 99; visual analogue scale (VAS) score, 6

The patient experienced an intense, aching pain and heat sensation, especially at night.

5) General condition

(1) Sleep pattern: maintaining light sleep from 12 A.M. to 8 A.M. because of pain.

(2) Dietary state: originally eupepsia (one bowl of rice per meal). His appetite had decreased after surgery (between a-one-half and one bowl of rice per meal).

(3) Urination: favorable

(4) Defecation: once a day, normal stool and fa-

orable

(5) Thirst: usually drinking more than average and preference for cold water

(6) Sweating: usually sweating more than average all over the body

(7) Tongue assessment: red tongue and slightly yellow tongue coating

(8) Radial pulse assessment: relaxed pulse (緩脈)

7. Physical and medical examination findings

1) Radiology

– Right knee MRI (2014/6/5) (Fig. 1)

Replacement of the normal striated appearance by a cloud-like high signal intensity

Discontinuity of the ligament and fibers, which were not parallel to the intercondylar roof

– Right knee plain radiography (2014/7/10) (Fig. 2)

Postoperative clip

2) Physical examination

ROM flexion active, 0°; passive, 45°

extension active, 0°; passive, 20°

Apley compression test, uncheckable

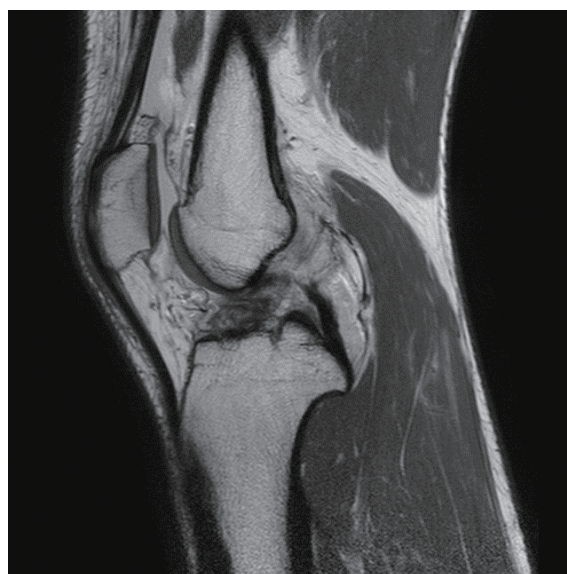


Fig. 1. Sagittal image of right knee (2014/6/5)

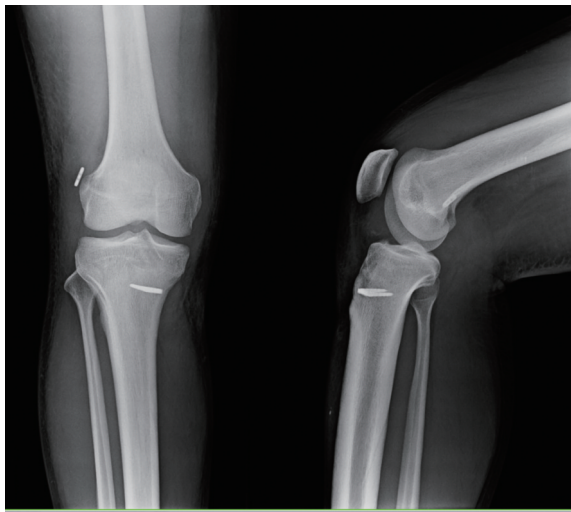


Fig. 2. Right knee AP & lat X-ray (2014/7/10)

- Apley distraction test, uncheckable
- McMurray test, uncheckable
- Abduction stress test, uncheckable
- Adduction stress test, uncheckable
- Dreyer's test, uncheckable
- Drawer's sign, uncheckable
- Patella grinding test, uncheckable
- Patella apprehension test, uncheckable
- * Special test : unchecked because of pain

3) Blood test

ALT 91↑ CRP 105.1↑ Hb 12.9↓ Hct 39.3↓
Monocyte 12.7↑ ESR 50↑

4) Vital signs

Blood pressure, 140/100mmHg; heart rate, 87 beats/min; respiration, 20 breaths/min; temperature, 36.7°C; BST, 101 mg/dl

8. Interventions

1) Acupuncture

Acupuncture was applied twice a day. The patient was treated at six acupoints on the unaffected side, Dadu (大都, SP02), Shaofu (少府, HT08), Jiexi (解谿, ST41), Qulinqi (足臨泣, GB41), Xiashi (俠

谿, GB43) and Zutonggu (足通谷, BL66), by using the one-insertion method (單刺法) in the morning. The needles were disposable stainless steel needles 0.30 mm in diameter and 0.40 mm in length (Dongbang Acupuncture Inc., South Korea). Meanwhile, in the afternoon, acupuncture was applied at Weizhong (委中, BL40), Liangqiu (梁丘, ST34), Xuehai (血海, SP10), Yinshi (陰市, ST33), Jimen (箕門, SP11) and Biguan (脾關, ST31), by using with disposable stainless steel needles 0.35mm in diameter and 60mm in length (Dongbang Acupuncture Inc.) together with electrical stimulation (Es-160, ITO Co, Japan) at 1.5 V and 4 Hz at a constant mode for 15 min.

2) Medication

Modified Danggwijeom-tong-Tang was prescribed from July 9, 2014, the first day of admission, to August 2, 2014 (Table 1). During hospitalization, the patient was given 80 cc of the medicine 30 min after each meal three times a day.

Table 1. The Composition of Modified Danggwijeom-tong-Tang

Name of Herb	Weight per Pack (g)
茵陳(<i>Artemisia capillaris</i>)	2
苦蔘(<i>Sophora flavescens</i>)	1
當歸(<i>Angelica gigas</i>)	1
知母(<i>Anemarrhena asphodeloides</i>)	1
豬苓(<i>Polyporus umbellatus</i>)	1
白朮(<i>Atractylodes japonica</i>)	1
葛根(<i>Pueraria lobata</i>)	1
蒼朮(<i>Atractylodes japonica</i>)	1
人蔘(<i>Panax ginseng</i>)	1
白茯苓(<i>Poria cocos</i>)	1
升麻(<i>Cimicifuga acerina</i>)	1
黃芩(<i>Scutellaria baicalensis</i>)	2
澤瀉(<i>Alisma canaliculatum</i>)	1
羌活(<i>Angelica koreana</i>)	2
防己(<i>Sinomenium acutum</i>)	1
甘草(<i>Glycyrrhiza uralensis</i>)	2

3) Physiotherapy

Quadriceps setting exercise (QSE) was prescribed to make the patient exercise voluntarily during any spare time. Rehabilitation treatment was performed from July 21 to August 2, 2014, and included transcutaneous electrical nerve stimulation, interferential current therapy (ICT), physiotherapy, cryotherapy and rehabilitative manipulation.

9. Outcome Measures

1) VAS⁷⁾

The VAS was used for evaluating the degree of pain. VAS is a measurement instrument for indicating the subjective level of pain by using a continuous horizontal line. The patient indicated his degree of pain by marking a point on the 100 mm long line, with 0mm, indicating “no pain” and 100mm, indicating “the worst pain he could imagine”. The VAS score was measured as the point marked by the patient.

2) KOOS⁸⁾

The KOOS was developed and validated by Roos Ewa M., Professor at the Department of Orthopaedics, Lund University, Sweden, in 1998, as an assessment tool, which was an improvement over The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), for evaluating knee injuries and osteoarthritis after a trauma. This instrument has been used for assessing various forms of acute knee injuries, such as ACL reconstruction, meniscus injury, and post-traumatic osteoarthritis in young and physically active patients aged between 14 and 78 years. It is an appropriate assessment tool to monitor the chronic consequences of various combinations of knee injuries, considering the process of osteoarthritis. In particular, questionnaires were designed to increase the sensitivity to traumatic arthritis by examining five different subscales. In Western countries, the validity, reliability, and responsiveness of KOOS have been verified through various

processes, and it is being used as a clinical measurement instrument. It is considered a more improved method than WOMAC. In Korea, similar results have been reported on the validity, reliability, and responsiveness of the Korean version of the KOOS.⁹⁾

The KOOS consists of five subscales and 42 questions used to assess the function of the patients' knee and associated problems. These include symptoms and stiffness (seven questions), pain (five questions), activities of daily living (17 questions), sport and recreation function (five questions) and knee-related quality of life (four questions).

The questionnaire evaluates the patient's status during the past week. The patient fills out the questionnaire, and it requires about 5 to 10 min to complete.

The response options for each question are given on a 5-point Likert scale (0=none, 1=mild, 2=moderate, 3=severe, and 4=extreme). The raw score in the assessment instrument is in the range of 0-168 points, and a lower score indicates a healthier status. However, for convenience, a converted score is used in which each subscale has a range of 0-100 points, and a higher score indicates a better quality of life.

10. Treatment Progress

1) At the time of admission

At the time of admission, the patient was unable to bend his right knee. After the thigh was fixed with both hands, a passive flexion of 45° was possible. Active extension was impossible to perform and only passive extension was possible. The patient experienced severe pain when standing with a knee brace on and was unable to walk independently. In addition, when the right knee was palpated, swelling, fever, and redness were very severe, and he complained of a severe aching pain and heat sensation at night. The KOOS (total) was 99, and the VAS score was 6.

2) The first week of treatment (from July 10, 2014 to July 17, 2014)

- (1) Active flexion was possible up to 30–40°, and the pain improved by 40% when standing with a knee brace on.
- (2) The severity of the most uncomfortable, aching pain at night was reduced by 50%. Previously prescribed analgesics, such as Paracetamol and Pelubi tablets (both were antipyretic, analgesic, and anti-inflammatory), were taken when pain occurred, disregarding recommended usage. The average daily dose of five to six times a day was reduced to three times a day.
- (3) Based on the patient's self-evaluation, the flare from the right knee to the thigh improved by 30%, and the heat sensation improved by 20%.
- (4) The KOOS (total) was 94, and the VAS score was 3.

3) The second week of treatment (from July 15, 2014 to July 24, 2014)

- (1) Active flexion was restored to 85°, and the pain experienced during flexion improved. The patient was able to walk with a knee brace and performed rehabilitation exercises from July 21.
- (2) The aching pain at night disappeared, but a dull and stiff pain remained. The patient started walking independently with the existing knee brace. The pain was slightly improved. Therefore, the usage of Pelubi tablets

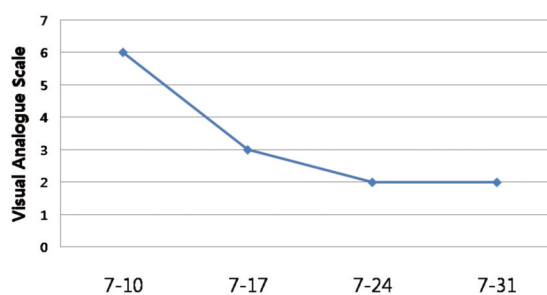


Fig. 3. Change of Visual Analogue Scale (VAS) of right knee pain

was decreased to one tablet twice a day.

- (3) Flare evaluated by the patient was improved by 60%, and the heat sensation was reduced by 50%.
- (4) The KOOS (total) was 109, and the VAS score was 2.

4) The third week of treatment (from July 25, 2014 to August 2, 2014)

- (1) Active flexion improved to 90° and there was almost no pain. However, the patient complained of stiff pain for 1 to 2 h after the rehabilitation exercises.
- (2) Stiff pain at night was improved by 90% and almost never felt. The average daily dose of Pelubi tablets was reduced to one tablet a day, taking it every time he had pain.
- (3) Flare disappeared and 90% of the heat sensation was lost.
- (4) The KOOS Score was 142, and the VAS score was 2.

Table 2. Change in the Knee Injury and Osteoarthritis Outcome Score (KOOS) of the Right Knee

Subscale Date	KOOS Pain	KOOS Symptom & stiffness	KOOS ADL*	KOOS Sport & Recreation function	KOOS QOL†	Total
7/10	25	39	29	0	6	99
7/17	36	39	19	0	0	94
7/24	39	36	28	0	6	109
7/31	50	36	43	0	13	142

* ADL: Activities of Daily Living.

† QOL: Quality of Life.

11. Literature search

In order to investigate previous studies on Korean medical treatment after soft-tissue surgery, we conducted a literature search of all papers published in Korea and overseas from the date of publication of each database up to January 1, 2017.

The search for English papers was conducted using two databases, PubMed (www.pubmed.com) and the Cochrane Library (www.cochranelibrary.com). The Korean papers were searched using the Korean Studies Information Service System (kiss.kstudy.com), Oasis (oasis.kiom.re.kr), and Korea Education and Research Information Service (www.riss.kr).

Korean and English were used as the search languages. In Korean, the search was performed using the keywords “침”, “침술”, “무릎 OR 인대 OR 반월판”, and related search keywords; moreover “재활” and “수술” were combined and searched for. In English, the following search expressions were used.

- #1. Acupuncture[mh]
- #2. Acup*[tiab]
- #3. (#1 OR #2)
- #4. knee[tiab]
- #5. knee joint
- #6. anterior cruciate ligament
- #7. menisci
- #8. collateral ligament
- #9. patella ligament
- #10. (#4 OR #5 OR #6 OR #7 OR #8 OR #9)
- #11. ligament reconstruction
- #12. post surgical pain
- #13. rehabilitation
- #14. (#11 OR #12 OR #13)
- #15. (#3 AND #10 AND #14)

The searches yielded 554 papers from abroad and 111 Korean papers. Through the review of the titles, abstracts, and, if possible, the original texts of these papers, we first identified three relevant papers from Korea and nine from abroad. Eleven of these papers were case reports, and one was a

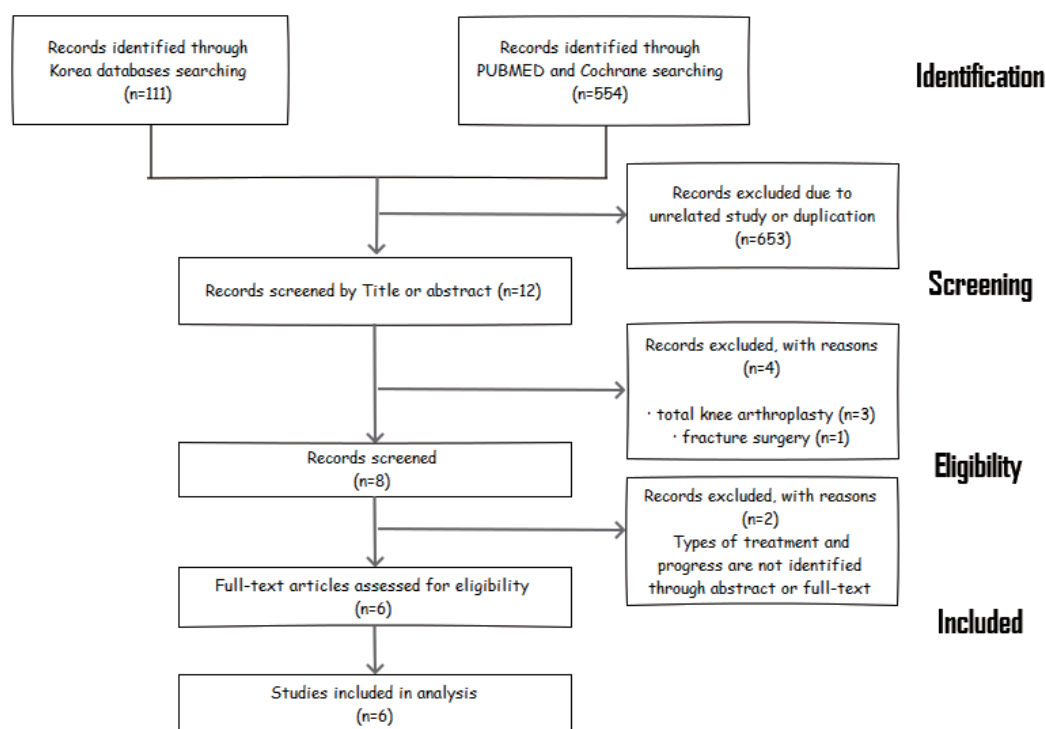


Fig. 4. Flowchart of inclusion studies

randomized controlled trial. All three Korean papers and five from abroad were included in our analysis. These studies described the treatment and management after ACL reconstruction or meniscectomy, excluding three studies on total knee arthroplasty and one on fracture surgery besides soft-tissue surgery. Six of the eight papers were finally selected, three from Korea¹⁰⁻¹²⁾ and three from abroad¹³⁻¹⁵⁾, excluding two papers whose

main articles could not be found (Tables 3 and 4).

According to Kang et al.¹⁰⁾ (2010), eight constitutional acupuncture was applied in a patient with persistent pain after meniscal surgery. Compared with body acupuncture, the eight constitutional acupuncture resulted an improvement in myofascial pain syndrome, pain intensity, recurrence, and ROM.

Oh et al.¹¹⁾ (2010) reported two cases of treatment

Table 3. Summary of Studies Included in Analysis (Case Reports)

First author (year)	Patient's sex/Age	Diagnosis (criteria) / Surgery	Treatment	Outcome	Treatment period
Kang (2011) ¹⁰⁾	F/37	Injury of lateral the ligament, lateral meniscus tear / Arthroscopic partial meniscectomy	Eight Constitutional acupuncture, Korean medicine, Hot pack, Ultra sonography, ICT*, Aqua PT†	ROM‡ Flexion 80→135 Extension -20→0 Pain scale 10→2	2001.04.18-2001.09.15
Oh (2010) ¹¹⁾	M/28	Nearly complete tear of the right ACL§, full amount of joint effusion Dx. /Reconstruction of the right ACL	Acupuncture Korean medicine Sweet BV (10,000:1) Bongchuna	VAS¶ 8→0-1 ROM Flexion 75°→150° Extension 25°→5° Lysholm Knee Score 17→88	2010.01.07-2010.01.27
Park (2016) ¹²⁾	M/27	Injury of the left ACL / Reconstruction of the left ACL	Acupuncture Moxibustion ICT Hot pack Korean medicine CPM**	VAS 3-4(at rest) and 4-5(during movement) → VAS 2 (at rest) and 3(during movement) ROM Flexion 95°→ 115° Extension 10°→ -5° Lysholm Knee score 26→63	2015.03.24-2015.04.16
Silvia (2016) ¹³⁾	20 physically active male patients aged between 18 and 40 years	Injury of the ACL / Reconstruction of the ACL	Dry needling (Acupuncture)	Pain decreased ($p<0.01$) ROM increased in flexion ($p<0.001$) EMG†† activity decreased at rest in the vastus Lateralis ($p<0.05$, ES=0.22)	-

* ICT: Interferential Current Therapy.
 † PT: Physiotherapy.
 ‡ ROM: Range of Motion.
 § ACL: Anterior Cruciate Ligament.
 || BV: Bee Venom.
 ¶ VAS: Visual Analogue Scale.
 ** CPM: Continuous Passive Motion.
 †† EMG: Electromyography.

Table 4. Summary of Study Included in Analysis (Randomized Controlled Trial)

First author (year)	Sample size Sex(M/F) Mean	Diagnosis (criteria)	Intervention group(regimen)	Control group(regimen)	Main outcomes	Intergroup differences
Liang (2006) ¹⁴⁾	32 inpatients (19 males and 13 females)	Injuries of the anterior cruciate ligament / anterior cruciate ligament reconstruction	(A) TCM(acupuncture) combining rehabilitation training (n=16)	(B) only rehabilitation (n=16)	Pain level ROM Knee joint function	$p < 0.05$

* TCM: Traditional Chinese Medicine.

based on Korean medicine for ACL rupture. One of the patients complained of persistent pain even after ACL reconstruction. This patient was treated with acupuncture twice a day, 30 times, at Damjeonggyeok (Sa-am Gallbladder Tonification) of the unaffected side with Sanyinjiao (三陰交, SP6), Weizhong (委中, BL40), Xiyan (膝眼, EX17), Zusanli (足三里, ST36), Yanglingquan (陽陵泉, GB34), Xuehai (血海, SP10) and Liangqiu (梁丘, ST34) of the affected side. Approximately 0.2 cc of sweet bee venom per day was injected at a ratio of 100,000: 1. In addition, Gamijihwang-tang was administered in combination with Bongchuna, and the treatment showed significant effects on the index of VAS, ROM, and Lysholm score.

In another study, Park et al.¹²⁾ (2016), reported the case of a 27-year-old man with persistent pain after ACL reconstruction. He received acupuncture twice daily at Dubi (犢鼻, ST35), Chengshan (承山, BL57), Xuehai (血海, SP10), and Yanglingquan (陽陵泉, GB34), and was treated with continuous passive motion twice daily for 20 min. In addition, indirect moxibustion, ICT, hotpack, and herbal medication were performed concurrently. The treatments were proven to have significant efficacy in terms of parameters such as the VAS, ROM, and Lysholm score.

Silvia et al.¹³⁾ (2016) applied electroacupuncture to 20 patients who underwent ACL reconstruction but had with persistent pain and incomplete ROM. After electroacupuncture stimulation, pain in the knee decreased and electromyographic(EMG)

changes in the vastus lateralis and vastus medialis muscles were observed.

In a study conducted by Nikiforos et al.¹⁴⁾ (2009), a 62-year-old woman who had complained of chronic pain after meniscal resection was treated with 2-week electroacupuncture. After this, the level of subjective pain experienced by the patient decreased.

Liang¹⁵⁾ (2006) conducted a randomized controlled trial that included 32 patients who underwent ACL reconstruction, and who were divided into two groups of 16 patients each. One group received rehabilitation treatment and acupuncture, and the other group received only rehabilitation. The patients who received the combination of herbal medication and acupuncture showed less pain and swelling than did the patients who received only rehabilitation.

III. Discussion

The number of knee surgeries being performed has increased and the use of Korean medicinal approach for the control and management of pain after various surgeries has been increasing. However, only a few studies have investigated the patient's pain control and management after soft tissue reconstruction. We reported a case in which Korean medicinal treatment was applied after

knee surgery and conducted a literature review on this subject.

Our literature search yielded six reference articles, including Liang's article¹⁵ from 2006, which was a randomized controlled trial, and five other case reports. Among them, they included a maximum of two cases per study except Silvia's research that included 20 cases. Further studies should include many more cases to draw more solid conclusions.

In each study, several instruments were used as an index to evaluate the recovery of patients. VAS, which is an objective pain index, and ROM were the most commonly used indexes, as in the current study.

In addition, studies by Oh et al.¹¹ (2010) and Park et al.¹² (2016) used the Lysholm score to assess knee ligament function. The Lysholm score consists of eight questions on pain, swelling, limpness, squatting, instability, support, stair-climbing and locking. Of the total score of 100, pain and instability account for 25 points each¹⁶. EMGs were performed in a study by Silvia et al.¹³ (2016) to evaluate the strength of the weakened quadriceps muscle after ACL reconstruction. In our case, the VAS, ROM, and KOOS were used as the indexes to evaluate the recovery of the patient.

The patient in this study was treated for 7 days after the arthroscopic right ACL reconstruction on June 27, 2014, and was treated after discharge. However, he continued to experience pain, and his ROM did not recover. He visited the departments of acupuncture and moxibustion because he was unable to walk independently. Afterwards, he was admitted to the hospital and received Korean medical treatment from July 10, 2014 to August 2, 2014.

The knee is referred to “肝之合，膝也”，“腎主骨” and is closely related to the liver and kidney in Korean medicine theory. According to the theory, the liver is responsible for/connected to the muscle and the kidney is responsible for/connected to the bone. When the two organs weaken, pathogenic qi [邪氣] of wind-cold-dampness [風寒濕] invades in the weakened state of the bone and muscle or

blood stasis because of injury, and this results in disturbances in the circulation of qi and blood. Thus, knee diseases such as 膝痛, 膝中痛, 膝重, 膝外廉通, 鶴膝風, and 膝痺 occur. These cases are accompanied by symptoms, such as pain [疼痛], swelling [腫脹], numbness [麻木], joint swelling [關節腫大] and difficulty in flexion or extension [屈伸不利], and they are recommended 清熱, 散寒濕, 強筋骨, 滋陰養血, 補氣血, 補肝腎, 活血去瘀, 補腎將陽, 消腫止痛 and 溫經通絡 as treatment methods¹¹

In this case, the patient was diagnosed with and treated for damp-heat [濕熱] based on severe knee edema and pain at the time of admission, difficulty in flexion or extension, knee joint fixation, and systemic conditions such as heaviness of the body.

Acupuncture was the main treatment method in this case and was performed twice a day, once in the morning and again in the afternoon. In the morning, Dadu (大都, SP02), Shaofu (少府, HT08), Jiexi (解谿, ST41), Qulinqi (足臨泣, GB41), Xiashi (俠谿, GB43) and Zutonggu (足通谷, BL66) were selected to help improve the circulation of the meridians. In the afternoon, Weizhong (委中, BL40), Liangqiu (梁丘, ST34), Xuehai (血海, SP10), Yinshi (陰市, ST33), Jimen (箕門, SP11) and Biguan (脾關, ST31) were selected as local acupoints and stimulated via electroacupuncture.

In various studies, acupuncture has been known to induce the release of neuropeptides at the nerve endings, thus dilating blood vessels and exerting anti-inflammatory effects^{17,18}. The effect of acupuncture on the proliferation of collagen in the ligament has also been reported¹⁹, and we presumed that it was effective in improving the strength of the weakened cruciate ligament.

Danggwijeomtong-Tang, used in this patient, is a prescription in the Oehyeong chapter of Donguibogam. It is known to cure swelling and pain caused by beriberi resulting from damp-heat. In this case, the patient had a well-built physique and usually experienced heaviness of the body and sweating more than average. Furthermore, he had severe swelling and a feeling of heat at the knee at the time of admission; thus, he was diagnosed as

having damp-heat[濕熱]. We tried to remove the damp-heat to improve the knee symptoms. In addition, the long-term use of Danggwijeomtong-Tang has been reported to reduce anti-collagen antibody levels and to decrease CRP levels and the ESR²⁰. Therefore, the decreased CRP and ESR and increased collagen level of the patient were expected.

QSE was performed voluntarily for the rapid recovery of the weakened muscle strength after surgery. QSE is an isometric exercise to enhance the strength of the quadriceps muscle, and it is a method to induce isometric contraction by pushing a towel under the knee in a sitting position with the knee extended²¹. The results of the study showed that the peak torque, peak torque per body weight, maximum repetition total work, average power, and total work showed a statistically significant increase in patients with ACL reconstruction who underwent QSE of the extensor muscle²².

The patient could not perform active movement of the right knee joint and could not walk independently. In the first week of treatment, active flexion of the right knee joint was possible up to 30–40°, and in the second week, it was restored to 85° and independent walking was possible. The ROM recovered up to 90° of active flexion in the third week of hospitalization.

Pain at the time of admission decreased from VAS score 6 to VAS score 2 in the first week of admission. Thereafter, it decrease steadily, and there was little pain at the time of discharge. Moreover, the flare at the time of admission completely disappeared, and the heat sensation decreased by 90%. The KOOS showed a total score of 99 at the time of admission, but improved to 142 at the time of discharge, showing improvements in the evaluation of stiffness, activities of daily living, sports and recreation function as well as pain. With respect to progression, the pain was rapidly recovered from the first week, and other subscales related to function improved by the third week of treatment.

Thus, acupuncture combined with herbal medication and physiotherapy was effective in improv-

ing the clinical symptoms of ACL reconstruction. Although many studies have investigated acupuncture treatments for ligament injuries, only few cases involved the use of Korean medical treatment for post-operative symptoms. Even in those cases, most of the patients experienced symptoms immediately after the surgery. Therefore, the fact that the current patient developed symptoms 1 month after the surgery it is a differentiating factor.

In addition, it is significant that the degree of improvement of knee joint function can be assessed using the KOOS, which is an instrument for evaluating knee joint function similar to the ROM and VAS. The KOOS is better for prolonged monitoring than is the Lysholm score, which is usually used in domestic research. Future studies should apply the KOOS in young and active patients and verify its reliability and validity. Furthermore, another strength of the KOOS is that it entails a lower possibility of observer bias than does the Lysholm score.⁸⁾

A limitation of this study was that only one case was evaluated, and there was no follow-up after discharge. In addition, acupuncture, the main treatment in this case, as well as herbal medication and physiotherapy were combined; therefore, it is difficult to identify the individual effect of acupuncture. Moreover, there is a lack of imaging results such as MRI or plain radiography at discharge. Since just one case was reviewed, the possibility of natural progression cannot be excluded. Accordingly, further studies are warranted on Korean medical treatment for postoperative symptoms in patients undergoing surgery, in order to develop a suitable postoperative treatment protocol.

IV. References

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