



Original Article

Analysis of the Effects on the Level of Pain and Functional Improvement After Integrated Korean Medicine in Patients with Shoulder Impingement Syndrome: A Retrospective Chart Review



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ABSTRACT

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Background: This study investigated the clinical effectiveness of Korean medicine (KM) treatment for shoulder impingement syndrome (SIS).

Methods: There were 61 patients who were diagnosed with SIS in the Jaseng hospital network of KM (7 hospitals located in Korea: Gangnam, Daejeon, Bucheon, Haerundae, Bundang, Ulsan, and Gwangju) between January 1st, 2015 and December 31st, 2020 who were retrospectively reviewed. The patients were grouped according to complications, intake of analgesics, duration of illness preadmission, and treatment. Treatments consisted of herbal medicine, acupuncture, cupping, Chuna, pharmacopuncture, bee venom pharmacopuncture, medicinal steaming, Daoyin exercises, and physical therapy. By comparing the Numeric Rating Scale (NRS), Shoulder Pain and Disability Index, and European Quality of Life 5-Dimensions questionnaire scores, the effectiveness of integrated KM treatment was evaluated.

Results: There were 14 males and 47 females. For inpatients diagnosed with SIS, the mean NRS score decreased from 5.78 ± 1.33 to 3.40 ± 1.43 ($p < 0.001$). The mean Shoulder Pain and Disability Index score decreased from 53.87 ± 14.76 to 38.56 ± 18.87 ($p < 0.001$), and the mean European Quality of Life 5-Dimensions questionnaire increased from 0.67 ± 0.13 to 0.76 ± 0.09 ($p < 0.001$) after KM treatment. Medicinal steaming (0.398; $p < 0.001$), acupuncture (0.290), cupping (0.288), bee venom pharmacopuncture (0.282), and Daoyin exercises (0.262; $p < 0.05$) had a positive correlation with improved changes in the NRS score.

Conclusion: Conclusion: Treatment with integrated KM treatment improved the pain, range of motion, shoulder function, and quality of life of patients with SIS.

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Introduction

Shoulder pain is common. Its prevalence has been previously reported in 2010 as 27% in the US, in 2010 as 22% in Australia, in 1998 as 14% in the UK, and in 2011 as 11% in Canada [1]. It has been reported that 44% to 65% of shoulder pain is caused by

shoulder impingement syndrome (SIS) [2]. The main symptoms of SIS are pain caused when the arm is raised between 70° to 120° (the “painful arc”), when the arms are lifted overhead passively, and when lying in a lateral position with the painful shoulder down.

Treatments of SIS includes conservative treatments such as rest, injection with steroid, exercise therapy and physiotherapy,

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and surgical treatments such as arthroscopic subacromial decompression, capsular release, and rotator cuff repair [3]. It is common to first try nonsteroidal anti-inflammatory drugs, exercise therapy, then corticosteroid injection to treat SIS. Surgery can be performed if the pain lasts for more than six months or if there is a structural abnormality [4]. It has been reported that about 67% of conservative treatments have shown satisfactory results within 2 years [5], and conservative treatments have been primarily recommended in recent years. Although surgical treatment has been reported to have similar effects to conservative treatment [6], surgery is highly invasive, and there are the possibility of side effects, in addition to the financial burden. Furthermore, the effects of corticosteroid injection therapy [7], ultrasound [8], and pulsed electromagnetic field [9] which are used as conservative treatment methods, are controversial. Since a clear, a “gold standard” treatment has not been established, various treatments are being used in Korea. Acupuncture, pharmacopuncture, Chuna, and herbal medicine are recommended by the Korean medicine (KM) Clinical Practice Guideline for shoulder pain [10]. Although these treatments have low to moderate levels of evidence.

The number of studies on SIS is insufficient to judge the effectiveness of integrated KM treatment for SIS. There have not been large-scale studies reported on integrated KM treatment for SIS. This study included 61 inpatients hospitalized with shoulder joint pain as a chief complaint, who were diagnosed with SIS and treated with integrated KM treatment. Through this retrospective chart review, we intended to evaluate the effectiveness of integrated KM treatment on SIS.

Materials and Methods

This study was a retrospective chart review of 61 patients whose chief complaint was shoulder joint pain, who were diagnosed with SIS and hospitalized. From January 1st, 2015 to December 31st, 2020, patients who visited 1 of the 7 Jaseng hospitals of KM (Gangnam, Daejeon, Bucheon, Haeundae, Bundang, Ulsan, and Gwangju) who were diagnosed with SIS were included in this study. Demographic characteristics and medical records related to SIS were collated using the electronic medical records of those who met the inclusion criteria. The SIS diagnosis in patients with shoulder joint pain was confirmed by a radiologist and a KM doctor (with more than five years of clinical experience) based on shoulder X-ray and magnetic resonance imaging findings.

Patients

There were 146 inpatients diagnosed with SIS and received inpatient treatment. However, 23 patients chief complaint was not shoulder pain, 27 patients were admitted for less than five days, 22 patients had insufficient data, and one patient's pain was caused by a traffic accident, 11 patients with complete rotator cuff tears underwent operations, and one patient with neoplasm were excluded from the study (Fig. 1).

Inclusion criteria

The following patients were considered suitable: (1) patients with

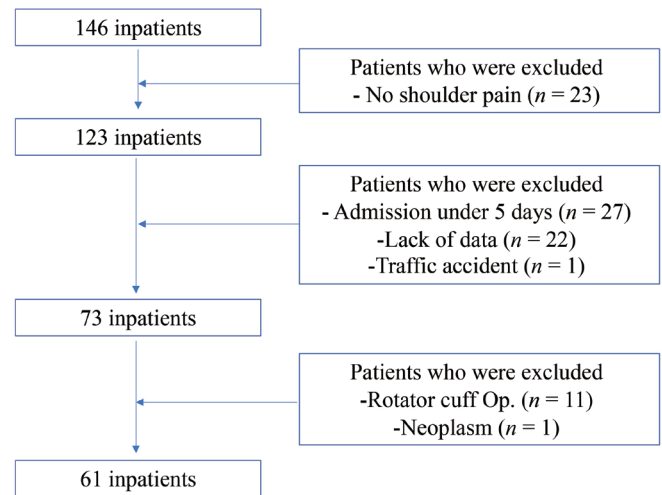


Fig. 1. Flow diagram of patients included in the study.

shoulder pain over the age of 19 who received inpatient treatment; (2) patients diagnosed with SIS based on radiological findings and physical examination; and (3) patients with abnormal sounds in the shoulder joint or worsening shoulder pain during shoulder movement.

Exclusion criteria

The exclusion criteria of this study were: (1) shoulder pain due to other diseases (including cervical disk herniation, arthritis, fracture, neoplasm); (2) complete rotator cuff tears; (3) adhesive capsulitis (frozen shoulder) including shoulder joint passive movement disorder; (4) hospitalization period of under five days; (5) shoulder pain caused by a traffic accident; (6) insufficient data in chart records; and (7) cases judged by the investigator to be unsuitable for participation in the study.

General information

The characteristics of the patients, such as gender, age, area of pain, and hospitalization period were reviewed. The causes of SIS were classified as reason unknown, overwork or over-exercise, and fall or bump. Patients were reviewed regardless of whether the patients received physical therapy before admission, had complications accompanying SIS, or had an intake of analgesics during the admission period. Illness duration before hospitalization was classified as acute (1–30 days), subacute (31–180 days), or chronic (over 180 days).

The data collected during the hospitalization period included admission and discharge day. Based on the medical records during the hospitalization period, demographic characteristics including gender, age, past history, social history, and medical records related to SIS were collated (physical and radiological diagnostic findings) and investigated

Ethical statement

This study followed the Declaration of Helsinki and was

conducted according to the STROBE guidelines. This retrospective study was approved by the Jaseng hospital of Korean medicine's IRB (approval no.: JASENG 2022-01-008; approval date: 26 January 2022).

Treatments

Herbal medicine

Herbal medicines were prescribed according to the judgment of the KM doctor, and each prescription was patient-specific. Inpatients took these herbal medicines 3 times a day (120 cc/pack); 30 minutes after meals.

Acupuncture

Acupuncture was performed by a KM doctor, and 0.25 × 0.30 mm standardized, disposable stainless needles (Dongbang Medical, Seongnam, Korea) were used for the treatment. The acupuncture was administered at LI15, LI16, TE15, SI10, SI14, GB21, and the Ashi points to a depth of 1.0–2.5 cm for 15 minutes. Inpatients received acupuncture treatment twice daily with electroacupuncture (StraTek, Anyang, Korea).

Shinbaro pharmacopuncture

Shinbaro pharmacopuncture was performed by a KM doctor using a disposable insulin syringe (29G × 13 mm needle, 1 mL, Sungshim Medical, Bucheon, Korea) filled with Shinbaro (Jaseng Spine and Joint Research Institute, Namyangju, Korea) which was injected at similar points as described for acupuncture treatment. Among the acupoints around the shoulder, Shinbaro was injected into particularly painful points or trigger points. A maximum total of 1 mL (0.25–0.5 mL per acupoint) each was injected to a depth of 1 cm at the 2–4 points.

Bee venom pharmacopuncture

Bee venom (BV) pharmacopuncture was performed by a KM doctor by injecting purified diluted bee venom into acupoints. A disposable insulin syringe (29G × 13 mm needle, 1 mL, Sungshim Medical, Bucheon, Korea) was used containing 5% (20,000:1) BV (Jaseng Spine and Joint Research Institute, Namyangju, Korea) which was injected at similar points to the acupuncture treatment. Among the acupoints around the shoulder, BV was injected into particularly painful points or trigger points. A maximum total of 1 mL (0.25–0.5 mL per acupoint) each was injected to a depth of 1 cm at the 2–4 points.

Cupping

The cups used for cupping were disposable 37 mm diameter cups (Dong-bang Medical, Seongnam, Korea). Cupping was performed twice daily at the same points identified for acupuncture treatment.

Chuna

Chuna was performed for about 10–15 minutes once a day according to the symptoms and progress of each patient which was directed by their KM doctor. The traction technique was applied to the glenohumeral joint to widen the subacromial space, and the scapular–thoracic joint motion technique was used to increase

range of motion.

Medicinal steaming

23 medicinal herbs with anti-inflammatory and analgesic effects such as *Achyranthes bidentata* Blume, *Saposhnikovia Radix*, and *Angelicae Dahuricae Radix*, were put in a pack. The composition of medicinal herbs was slightly modified from geo-sub-hwal-hyul-ji-tong-tang. After steaming, the medicinal pack was applied to the shoulder joint for 15–20 minutes, once a day.

Daoyin exercise

In cases of shoulder joint function limitation, the KM doctor directly applied force to the patients to create active and passive movements to enable normal movement.

Physical therapy

Interferential current therapy/transcutaneous electrical nerve stimulation, manual therapy, and extracorporeal shock wave therapy was performed by a physical therapist under a doctor's instruction.

Assessment methods

All evaluation indexes were collated from admission and discharge using electronic medical records.

Numeric rating scale (NRS)

The NRS is a numerical pain scale used to describe the level of subjective pain felt by a patient. The level of pain was denoted by 0 indicating a painless state and 10 indicating the most unbearable pain.

Shoulder pain and disability index (SPADI)

The SPADI consists of 13 questions, including five questions to evaluate pain level and eight questions to evaluate function/disability, designed to measure the degree of impairment in movement. A score of 0 means the most perfect condition, and a score of 100 means the worst condition [11].

European quality of life 5-dimensions (EQ-5D)

EQ-5D is a tool developed to evaluate current health-related quality of life and consists of five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression.

Range of motion (ROM)

ROM is an evaluation index for shoulder mobility, and the angles of flexion, extension, abduction, adduction, internal rotation, and external rotation were measured.

Data analysis method

Statistical analysis was conducted using SPSS Version 28.0 for Windows (SPSS Inc., USA). The data were presented as mean ± SD, and a normality test was performed before statistical analysis. A paired *t* test was used for parametric data and a Wilcoxon signed-rank test was used for nonparametric data. The Spearman correlation coefficient was used for the correlation analysis between

Table 1. Characteristics of the Participants.

Category	Total (N = 61)	
Age (y)	55.1 ± 9.9 (24-77)	
Gender	Male: 14 (23.0), female: 47 (77.0)	
Pain area	Left: 12 (19.7), right: 28 (45.9), both: 21 (34.4)	
Causes	Reason unknown: 44 (72.1), overwork or excessive exercise: 14 (23.0), fall or collision: 3 (4.9)	
Hospitalization period (d)	29.95 ± 20.20 (5-89)	
Intake of analgesics	Yes: 22 (36.1), No: 39 (63.9)	
Pre-Western treatment*	Yes: 30 (49.2)	Physiotherapy: 14 (23.0), injection: 14 (23.0), oral analgesics: 12 (19.7), surgery: 4 (6.5),
	No: 31 (50.8)	
Complications†	Yes: 28 (45.9)	Rotator cuff partial tear/tendinitis: 16 (26.2), subacromial and subdeltoid bursitis: 10 (16.4), Calcific tendinitis: 2 (3.3),
	No: 31 (50.8)	

Date are presented as mean ± SD (range) or n (%).

* Some patients received multiple Western treatments in duplicate.

† There were 3 patients who had both rotator cuff partial tear/tendonitis and subacromial and subdeltoid bursitis, and one patient had both rotator cuff partial tear/tendonitis and calcific tendonitis.

changes in NRS scores and types of treatments.

Results

General information

Characteristics

The average age of the participants was 55.1 ± 9.9, range from 24 to 77 (Table 1).

Distribution of illness duration period

The mean illness duration period preadmission was 163.4 ± 187.6 days (range, 2-966). Eleven inpatients developed onset of SIS within one month (acute stage, 18.0%), 31 inpatients between 1-6 months (subacute stage, 50.8%), and 19 inpatients more than six months after onset of shoulder pain (chronic stage, 31.1%; Table 2).

Distributions of ROM restriction

Limitations in the ROM were frequently observed for abduction as measured at admission (N = 33, 54.0%). Flexion (N = 23, 37.7%) and extension (N = 16, 26.2%) followed. ROM measured at discharge was classified as a case of recovered-to-normal ROM or as a case of improved-but-not-normal ROM. The improvement rate (admission results compared with discharge results) was 60.8% for flexion, 75.0% for extension, 60.6% for abduction, 36.3% for adduction, 88.8% for internal rotation, and 71.4% for external rotation (Table 3).

Frequency of treatment

Herbal medicines were counted by the number of days taken (3

Table 2. Distribution of Illness Duration Period Preadmission.

Illness duration period preadmission (d)	N	%
Acute (1-30)	11	18.0
Subacute (31-180)	31	50.8
Chronic (≥ 181)	19	31.1
Total	61	100.0

packs per day), and other treatments were counted by the number of times. Herbal medicines were prescribed to all inpatients according to individual patient symptoms, and the average number of days of treatment was 29.6 ± 20.2 days. All inpatients received acupuncture and cupping, and the average number of times were 48.6 ± 36.6, and 48.6 ± 37.7, respectively. Chuna was performed on 16 inpatients (26.2%, 25.9 ± 17.2). Shinbaro pharmacopuncture and BV pharmacopuncture were performed in 59 (96.7%, 48.2 ± 12.6), and 11 (18.0%, 12.9 ± 7.3) inpatients, respectively. Medicinal steaming was administered to 34 inpatients (55.7%, 19.7 ± 16.4). Daoyin exercise was performed in seven inpatients (11.5%), and the average number of times was 7.5.8 ± 10.4. Interferential current therapy/transcutaneous electrical nerve stimulation was performed on 22 inpatients (36.1%, 20.8 ± 16.7). Manual therapy was performed in 39 inpatients (63.9%, 21.0 ± 14.7), and extracorporeal shock wave therapy in 18 inpatients (29.5%, 14.1 ± 13.5; Table 4).

Table 3. Distributions of Shoulder ROM Restriction and Improvement.

ROM restriction		Flexion	Extension	Abduction	Adduction	Int. rotation	Ext. rotation
Admission (n, %)		23 (37.7)	16 (26.2)	33 (54.0)	11 (18.0)	9 (14.7)	7 (11.4)
Discharge (n, %)		14 (22.9)	6 (9.8)	19 (31.1)	7 (11.4)	3 (4.9)	4 (36.3)
Improved	Improved to normal ROM (n)	9	10	14	4	6	3
	Improved, but without normal ROM (n)	5	2	6	0	2	2
	Total (n)	14	12	20	4	8	5
Improvement rate* (%)	60.8	75.0	60.6	36.3	88.8	71.4	

* Improvement rate (%): improved/restriction from admission.
Ext, external; Int, internal; ROM, range of motion

Table 4. Frequency of KM Treatment.

	Herbal medicine	Acupuncture	Cupping	Chuna therapy	Pharmaco-puncture	BV	Medicinal steaming therapy	Daoyin exercise therapy	ICT/TENS	Manual therapy	ESWT
Yes	61	61	61	16	59	11	34	7	22	39	18
No	0	0	0	45	2	50	27	54	39	22	43
%	100	100	100	26.2	96.7	18.0	55.7	11.5	36.1	63.9	29.5
No. of times (Mean ± SD)	29.6 ± 20.2	48.6 ± 36.6	48.6 ± 37.7	25.9 ± 17.2	48.2 ± 40.6	12.9 ± 7.3	19.7 ± 16.4	7.5 ± 10.4	20.8 ± 16.7	21.0 ± 14.7	14.1 ± 13.5
Range	5-89	7-175	7-174	4-57	4-175	2-24	1-60	1-30	1-52	3-68	1-58

BV, bee venom pharmacopuncture; ICT/TENS, interferential current therapy/ transcutaneous electrical nerve stimulation; ESWT, extracorporeal shockwave therapy.

Assessments

NRS

Inpatients' mean NRS score \pm SD decreased from 5.78 ± 1.33 to 3.40 ± 1.43 ($p < 0.001$). Regardless of classification, the NRS scores significantly decreased in each group (complicated by rotator cuff condition/disease, use of analgesics, and duration of illness preadmission; Table 5).

SPADI

Comparing all inpatients' SPADI scores, a decrease from 53.87 ± 14.76 to 38.56 ± 18.87 was observed ($p < 0.001$). Regardless of classification (complicated by rotator cuff condition/disease, use of analgesics, and duration of illness preadmission) the scores decreased significantly in each group (Table 6).

EQ-5D

The average inpatients' EQ-5d scores increased from 0.67 ± 0.13 to 0.76 ± 0.09 ($p < 0.001$). Regardless of classification by rotator cuff condition/disease or the use of analgesics, the EQ-5d score significantly increased in each group. When classified according to the illness duration period, there was no significant improvement in EQ-5d score in the acute stage ($p = 0.141$), whereas it increased significantly in the subacute, and chronic stages ($p < 0.001$; Table 7).

Correlation between treatments and NRS score change

Spearman correlation coefficient analysis of the number of treatments and changes in NRS scores when comparing before and after treatment revealed significant positive correlations for the following: medicinal steaming (0.398 ; $p < 0.001$), acupuncture (0.290), cupping (0.288), BV (0.282), and Daoyin exercises (0.262 ; $p < 0.05$; Table 8).

Table 5. Changes in NRS Following Korean Medicine Treatment.

	<i>N</i>	NRS		<i>p</i>
		Before	After	
Total	61	5.78 ± 1.33	3.40 ± 1.43	< 0.001*
Complicated by rotator cuff condition/ disease	Yes	16	5.75 ± 1.00	< 0.001*
	No	45	5.80 ± 1.43	< 0.001†
Use of analgesics	Yes	22	5.59 ± 1.56	< 0.001*
	No	39	5.89 ± 1.18	< 0.001†
Duration of illness preadmission (d)	Acute	11	5.90 ± 0.83	0.001‡
	Subacute	31	6.00 ± 1.29	< 0.001†
	Chronic	19	5.36 ± 1.57	< 0.001†

Data are presented by mean ± SD.

* Paired t test; $p < 0.001$.

† Wilcoxon signed-rank test; $p < 0.001$.

‡ Paired t test; $p < 0.01$.

NRS, numeric rating scale.

Table 6. Changes in SPADI Score Following Korean Medicine Treatment.

	<i>N</i>	Total SPADI score		Before and after <i>P</i>
		Before	After	
Total	61	53.87 ± 14.76	38.56 ± 18.87	< 0.001*
Complicated by rotator cuff condition/ disease	Yes	16	50.72 ± 11.74	< 0.001*
	No	45	55.00 ± 15.65	< 0.001†
Use of analgesics	Yes	22	53.06 ± 15.72	0.003‡
	No	39	54.33 ± 14.38	< 0.001*
Illness duration preadmission	acute	11	54.56 ± 13.51	0.014§
	subacute	31	55.90 ± 13.56	< 0.001*
	chronic	19	50.17 ± 38.50	0.003‡

Data are presented by M ± SD.

* Paired t test; $p < 0.001$.

† Wilcoxon signed-rank test; $p < 0.001$.

‡ Paired t test; $p < 0.01$.

§ Paired t test; $p < 0.05$.

SPADI, shoulder pain and disability index.

Discussion

The 61 patients diagnosed with SIS in the Jaseng hospital network of KM between January 1st, 2015 and December 31st, 2020 were reviewed to investigate the effectiveness of KM treatment. The average NRS score at admission was 5.78 ± 1.33 which means that severe pain was experienced; most patients had passed the acute

period of SIS in this study before hospitalization. Restrictions on ROM frequently appeared for abduction ($N = 33$, 54.0%), flexion ($N = 23$, 37.7%), and extension ($N = 16$, 26.2%). After treatment, the improvement rate was 60.8% for flexion, 75.0% for extension, 60.6% for abduction, 36.3% for adduction, 88.8% for internal rotation, and 71.4% for external rotation. A previous study reported that after dry needling treatment, abduction and flexion ROM

Table 7. Changes in EQ-5D Score Following Korean Medicine Treatment.

EQ-5D		N	EQ-5D-5L index		p
			Before	After	
Total		61	0.67 ± 0.13	0.76 ± 0.09	<0.001*
Complicated by rotator cuff condition/disease	Yes	16	0.66 ± 0.16	0.79 ± 0.10	0.005†
	No	45	0.64 ± 0.11	0.74 ± 0.08	<0.001*
Use of analgesics	Yes	22	0.66 ± 0.12	0.75 ± 0.11	0.002†
	No	39	0.67 ± 0.13	0.76 ± 0.08	<0.001‡
Illness duration preadmission	acute	11	0.68 ± 0.08	0.74 ± 0.12	0.141
	subacute	31	0.64 ± 0.16	0.75 ± 0.08	<0.001‡
	chronic	19	0.70 ± 0.09	0.78 ± 0.09	<0.001*

Data are presented as mean ± SD.

*Paired t test; $p < 0.001$.

† Paired t test; $p < 0.01$.

‡ Wilcoxon signed-rank test; $p < 0.001$.

EQ-5D-5L, European quality of life 5-dimension. 5-level.

Table 8. Correlation Analysis Between Treatments and NRS Score Change.

	Acupuncture	Cupping	Chuna therapy	Pharmacopuncture	BV	Medicinal steaming therapy	Daoyin exercise program	ICT/TENS	Manual therapy	ESWT
Correlation coefficient	0.290	0.288	-0.162	0.152	0.282	0.398	0.262	0.019	0.232	-0.136
p	0.023†	0.025†	0.212	0.243	0.028†	0.001*	0.041†	0.883	0.072	0.297

* Spearman correlation analysis; $p < 0.01$.

† Spearman correlation analysis; $p < 0.05$.

ESWT, extracorporeal shockwave therapy; ICT, interferential current therapy; NRS, numeric rating scale; TENS, transcutaneous electrical nerve stimulation.

increased compared with the control group [12]. In this current study, not only did abduction and flexion ROM increase, but so did all directions of ROM (except adduction) improve in more than half the patients.

The NRS, SPADI scores after treatment significantly decreased in the entire patient population ($p < 0.001$) and each classified group (Tables 5 and 6). The EQ-5d score significantly increased after treatment in the entire patient population ($p < 0.001$). When analyzed by complications of rotator cuff condition/disease and the use of analgesics, the Eq-5d scores also significantly increased. Moreover, significant improvement was observed in the subacute and chronic stages of SIS ($p < 0.001$; Table 7). Since the shoulder joint is directly involved when the arms are used, symptoms of SIS closely impact upon and are related to quality of life. In this study, integrated KM treatment for SIS showed significant improvement in both the level of pain and the function of the shoulder joint, which

is thought to contribute to health-related quality of life. In a RCT of 73 patients who were treated with acupuncture for SIS, after 3 weeks (15 sessions in total) of acupuncture, the pain score improved from 7.0 ± 1.59 to 2.30 ± 1.48 , and SPADI scores improved from 77.66 ± 21.98 to 31.23 ± 14.7 [13]. The laser acupuncture control group had a pain score of 6.5 ± 1.31 to 6.03 ± 1.37 and SPADI score from 81.65 ± 16.76 to 76.12 ± 18.6 , and there was no significant difference [13]. The improvement in this current study was lower than the acupuncture group in the study by Kibar et al [13], but it showed better results than the laser acupuncture group. Although this study observed intensive acupuncture treatment (twice a day), Kibar et al [13] had several exercises (pendulum exercises, posterior capsule stretching, and isometric shoulder exercises) performed along with acupuncture treatment. This may positively affect the difference in improvement, and more studies on acupuncture combined with exercise therapy should be conducted.

Classification of SIS was divided, by Neer [14], into three stages according to progression. The 1st stage was regarded as a state in which edema and hematoma appeared in the subacromial space. In the 2nd stage, fibrosis of the soft tissues and irreversible changes in the rotator cuff could be observed, and in the 3rd stage, rotator cuff tears could be seen. Among the participants in this current study, 16 patients (26.2%) had a rotator cuff partial tear/tendonitis in addition to SIS. Using Neer's classification criteria, this can be seen as a state corresponding to Stage 2 or 3. In previous research, acupuncture combined with exercise was recommended for patients in the early stages of SIS [5]. In this study, both groups with and without a rotator cuff partial tear/tendonitis showed significant improvement in NRS, SPADI, and EQ-5d scores after treatment ($p < 0.001$). Furthermore, in the chronic stage (classified by days from onset as > 180 days), NRS ($p < 0.001$), SPADI ($p = 0.003$), and EQ-5d ($p < 0.001$) scores improved significantly. Therefore, the possibility of applying KM treatment to patients with SIS not only in the early stage, but also in the chronic stage, is viable.

All inpatients received herbal medicine, acupuncture, and cupping ($N = 61$, 100%) during the hospitalization period. After this, pharmacopuncture ($N = 59$, 96.7%) was performed with the highest frequency, and manual therapy ($N = 39$, 63.9%) and medicinal steaming ($N = 34$, 55.7%) were used in more than half of the patients. In the correlation analysis, medicinal steaming, acupuncture, cupping, BV pharmacopuncture, and Daoyin exercises had a statistically significant positive correlation with the changes in NRS scores after treatment. The correlation absolute value [15] was 0.398 for medicinal steaming ($p < 0.001$), which indicated the strength of the relationship was low ($0.3 < R < 0.5$), 0.290 for acupuncture, 0.288 for cupping, 0.282 for BV, and 0.262 for Daoyin exercises ($p < 0.05$), which implied the strength of the relationship was very low and there was a high risk that there was no correlation ($0 < R < 0.3$). Various treatments were used in combination as an integrative KM treatment, but among them, medicinal steaming, acupuncture, cupping, BV, and Daoyin exercises contributed the most to a reduction in pain caused by SIS.

Acupuncture is commonly used for shoulder pain. It has been used extensively and effectively for various musculoskeletal disorders [16]. Pharmacopuncture is a treatment that combines the mechanical stimulation effect of acupuncture and chemical stimulation through herbal extracts [17]. The Shinbaro pharmacopuncture used in this study contained GCSB-5 as a primary ingredient. It can modulate the acute and chronic inflammatory process, has a neuroprotective function, and can promote motor function recovery by reducing oxidative stress [18]. Cupping creates negative pressure so that hyperemia is induced in the local capillaries. Cupping can improve blood circulation, promote recovery, and relieve pain [19]. Medicinal steaming, which is similar to hot packs, offers the effects of herbal medicine and steaming at the same time. It usually applied to musculoskeletal disorders like osteoarthritis of the knee [20]. Chuna is a KM manipulative therapy delivered by the hands or instruments that treats functional and structural problems of the body by promoting stimulation.

In previous studies, integrated KM treatments used for SIS were reported mainly in the form of case reports [21,22]. In a

case-control study, acupuncture was reported to be an effective treatment for SIS [23], it was more effective than ultrasound treatment [24], and it was reported that it decreases the level of pain and increases shoulder function to a similar degree as injection with corticosteroid [25]. Large-scale studies have frequently been set up using acupuncture as a single intervention. However, as in most case reports (mentioned above) in the local field, applying a single intervention in isolation is uncommon. Usually, the treatments are applied as a multiple of KM treatments.

In this retrospective review 61 medical charts were analyzed to determine the effectiveness of integrated KM treatment on a larger scale than the single case report. It is meaningful to analyze the clinical characteristics of SIS, which can be utilized as basic data in future research for the treatment of SIS. In line with the recent trend of recommending conservative treatment rather than surgical treatment for SIS [26], integrated KM treatment can be another option when applying conservative treatment for SIS.

The limitations of this study are related to its retrospective design. Firstly, there was no control group. Additionally, chart review data were observed only with the documented information. We were unable to determine how much pain and disability patients experienced after discharge, because this was not consistently documented. This information (as outpatient follow up appointments) would be valuable to have a better understanding of how patients are managing their pain following discharge. Studies designed with a control group or studies with long term follow-up are needed in the future.

Conclusion

In this study, the effectiveness of integrated KM treatment for SIS was determined by using medical records to analyze patients diagnosed with SIS who were admitted to KM hospitals in Korea. Treatment with integrated KM can be an effective approach for managing SIS. Pain, ROM, disability, and quality of life were improved after the treatment.

Author Contributions

Conceptualization: ESK. Methodology: ESK. Formal investigation: ESK, SRJ and HSL. Data analysis: ESK and SKL. Writing original draft: ESK and YJL. Writing – review and editing: ESK, JHW and HEL.

Conflicts of Interest

The authors declare that they have no competing interests.

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Ethical Statement

Not applicable.

Data Availability

All relevant data are included in this manuscript.

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