Clinical Report 1 (Acupuncture)

A Clinical Report of Anterior Cruciate Ligament Injury Treating with Acupuncture and Physical Training for Collegiate Women's Lacrosse Player Akihito Uehara, Akinori Kihira, Yasuhisa Kaneko and Eiji Furuya Kuretake College Oriental Medicine Clinical Laboratory

[Introduction]

Women's lacrosse in Japan is a sport where two teams of 12 members each compete for points by shooting a ball into the opponent's goal on a field 110m long and 60m wide, in two 25-minute halves. A total of 8,698 female lacrosse athletes were registered with the Japan Lacrosse Association in fiscal 2013. The sport requires a variety of movements, such as running, dashing, cutting, and jumping. Injuries to the leg, and particularly to the ankles and knees, have been reported as the most common injuries sustained while playing lacrosse (1, 2).

Below is a report of a case where a lacrosse athlete who sustained an injury to her knee anterior cruciate ligament (ACL) while playing lacrosse received training (TR) and acupuncture treatment (AT) at Kuretake College Oriental Medicine Clinical Laboratory (KOMCL) with the cooperation of an orthopedic surgeon in private practice and a surgeon at a general hospital, and made a successful return to the sport.

[Patient's information]

- 1. Patient: 19-year-old female university student, height 154cm, weight 47kg
- 2. Treatment status: In May 2011 while playing in a lacrosse match, the patient heard a rupture sound and felt intense pain in her left knee when she tried to cut in front of the opposing team's defense player from the left to right, and fell. Immediately after the injury, she could not walk, due to the pain and a feeling of weakness.
- 3. Diagnosis and treatment: The patient first saw an orthopedic surgeon in private practice, and was referred to a general hospital, where she had

an MRI scan and was diagnosed with ACL damage. In July, she underwent reconstructive surgery by semitendinosus tendon graft (STG), and thereafter received training at the same hospital to recover her motor function. In November, her attending doctor gave her permission to engage in light exercise. A test of knee extension force in December showed a strength of 73.2kg in the right leg and 45.8kg in her left leg. The weight bearing index (WBI) was 1.52 for the right leg and 0.95 for her left leg.

- 4. Training and acupuncture treatment: The patient's first treatment session at KOMCL was on December 16.
 - Chief complaint at the time of the first treatment session: Feeling of apprehension about returning to the sport
 - (2) Subjective information: The patient experienced no pain from activities of daily living, but there was irregular pain when she engaged in weight training, jogging, and other such light exercises in which she applied her own weight. She also felt pain on the front and inner sides of her knee during light knee extension resistance training. She was told by her doctor that she should aim to return to the sport in February 2012. However, she felt strong apprehension at returning to the sport after only the functional recovery training she was presently undergoing.
 - (3) Objective information: Acute inflammation
 (-). Limitation in range of motion of the knee joint (-). Manual muscle testing (MMT) for left knee joint extension showed a strength of 4 on the right and 5 on the left. Stress test of the ligament around the knee (-). McMurray Test (-). Claudication (-). Left knee flexural failure and minor pain when walking down the stairs (+).
 - (4) Assessment: The patient made good progress after the surgery, and her obstacles in daily living were almost completely eliminated.

However, when she did a side step, a deviation in the center of gravity of her upper body to the sides of her base of support and knee-in were observed, and knee-in was also observed when she did a cross-over step. These were attributed to the low WBI of her left leg, which suggested a lack of absolute muscle strength that is demanded by the sport, and a low ability in performing the movements of the sport due to a long absence from practice. Thus, these two items were considered to be behind the patient's feeling of apprehension of returning to the sport.

(5) Treatment policy: The short-term goal was "to improve the lack of muscle strength and motor function" that was behind the patient's feeling of apprehension, and the long-term goal was "to increase performance after returning to the sport and prevent re-injury." Fig. 1 shows an image of the treatment policy. It was decided that KOMCL would provide training (TR) for strengthening muscle strength and posture control, which forms the basis of athletic rehabilitation (AR), in addition to acupuncture treatment (AT) for relieving muscle fatigue generated by the TR. The learning of sport motions was approached through AR performed in the training field.



Fig. 1: Treatment policy

[Method]

- (1) TR: Leg motions that were necessary for the sport were categorized into running motions, side steps, and cross-over steps and quick turns, and resistance TR was implemented with the goal of acquiring stability in the frontal, lateral, and horizontal directions of each movement and increasing muscle strength. With the side steps and cross-over steps, the patient performed the movements in front of a mirror and also recorded them on video, so she could correct her movements by herself. She was instructed to engage in repeated TR at home. Table 1 shows the objectives, activities, and assessment of her TR.
- (2) AT: Acupuncture was applied mainly to the lower back and leg using acupuncture needles 50mm long and 0.18mm in diameter. The major acupoints that were used were the Shenshu (BL23), Dachangshu (BL25), Huantiao (GB30), Yinmen (BL37), Chengji (BL56), Futu (ST32), Liangqiu (ST34), and Xuehai (SP10). The effect of acupuncture was examined by quantifying the degree of the symptoms using a visual analog scale (VAS) and comparing them before and after the treatment. For significance testing, significance level was set to 5% or less in a t-test. Fig. 2 shows the flow of training and acupuncture treatment.

(3)AR: AR was implemented once to two times a week by the patient's accompanying practice. The movements of her knee joint when cutting in and changing directions were recorded on video, and the patient was immediately shown the video. Problems in movement were broken down into frontal, lateral, and horizontal elements, and TR guidance was given to correct the movement. The patient's condition was reported to her attending surgeon by uploading the video to YouTube and making it accessible only by the surgeon. At the hospital, the surgeon assessed the patient's condition and provided guidance at a frequency of about one to two times a month (once in three months after she returned to the sport).

Fig. 3 shows a timeline of the patient's medical treatment. TR, AT and AR were each implemented by respective personnel, with the AR instructor assigned as the head of the team and placed in charge of sharing information with the doctor.

	Objective	Main activity	Assessment
1	a. Practice of basic running motions and	Squat	The lower back flexes noticeably when
	improvement of muscle strength	3 sets of 5	squatting.
2	a. Same as above	Squat	The lower back flexes somewhat when
		3 sets of 10	squatting.
	b. Practice of basic lateral travel (side step)	Side step	The upper body center of mass deviates
	motions and improvement of muscle strength	3 sets of 5	to the sides of the base of support.
3	a. Same as above	Squat	There is hardly any flexing of the lower
		3 sets of 10	back when squatting.
	b. Same as above	Side step	The upper body center of mass is
		3 sets of 10	contained within the base of support.
	c. Practice of basic turnaround (cross-over	Cross-over step	No clear instability is seen.
	step) motions	3 sets of 5	
4	a - c. The load of each motion is increased, to	Jumping motions that	The emergence of instability is
	simulate motions of the sport that	have been performed	remarkably small despite the increase
	accompany quick turns	above in each activity	in load.
		3 sets of 5	

Table 1: Training objectives, activities and assessment



Resistance training was performed in front of a mirror. The patient engaged in simple movements with a certain load, and problems were pointed out so she could perform repeat exercises at home and school.

The stability of frontal, lateral and horizontal movements were evaluated visually, and by video recording.

* Acupuncture treatment (4th to 14th sessions)

Using 0.50mm No. 18 stimulation was applied to the lower back and leg to a depth of around 10mm. To examine the immediate effect of acupuncture treatment, the patient was asked the intensity of her chief complaint before and after treatment using a Visual Analog Scale (VAS), and the results was evaluated by a t-test (p<0.05).

Fig. 2: Flow and content of treatment



Fig. 3: Timeline from surgery to retirement from the sport

[Result]

- TR: Training was conducted a total of four times until February 2012. In the fourth TR, an improvement was confirmed in the patient's sidestep motion. Similarly, an improvement was also seen in quick turns in lateral jumping movements.
- (2) AT: The first treatment was applied immediately after the fourth training session. Thereafter, it was applied at a frequency of one to two times a month, to alleviate pain and other complaints, and to relieve fatigue. The treatment was applied 14 times in all, from the first treatment to October 2012 when the patient retired from collegiate sports. According to the VAS, the average level of the patient's chief complaint was 40.6±21.6mm before treatment and 26.2±15.8mm after treatment, and showed a significant drop after treatment (p<0.01). Table 2 shows the VAS values before and after each treatment in regard to the chief complaint.
- (3) AR: AR was conducted seven times until February 2012. An improvement was confirmed in the knee-in condition when changing directions. The WBI measured at the hospital in the same month was 1.49 for the right leg and 1.25 for the left, so the attending doctor gave the

patient permission to return to the sport. The patient experienced no re-injury until she retired from collegiate sports in October, and was able to play in all student league matches.

Table 2: Complaints at the time of acupuncture treatmentand VAS values before and after treatment

		(Unit: mm)		
Number	Complaint	VAS value	VAS value	
of	-	(before	(after	
treatment		treatment)	treatment)	
sessions				
1	Lower back pain	15	21	
2	Heaviness in lower back	49	25	
3	Lower back pain	38	35	
	Fatigue in the leg	28	23	
	Pain on inner side of right knee	63	45	
4	Whole body fatigue	13	5	
5	Conditioning	0	0	
6	Conditioning	0	0	
7	Pain on the outer side of the right	30	20	
	foot	20	11	
	Pain on the front of the right hip joint	25	14	
	Lower back pain			
8	Pain on the outer side of the right	21	11	
	foot			
9	Whole body fatigue	64	34	
10	Leg fatigue	47	15	
11	Leg fatigue	57	19	
12	Pain on the bottom of the right foot	61	45	
	Pain on the outer side of the right	50	40	
	knee			
13	Pain on the bottom of the right foot	62	55	
	Leg fatigue	60	37	
	Pain on the outer side of the right	55	41	
	knee			
14	Pain on the front of the right hip joint	70	49	
	Pain on the outer side of the right	59	35	
	thigh			
	Pain on the bottom of the right foot	47	23	
	Average	40.6	26.2	
	SD	21.6	15.8	

Note: "Conditioning" is used when there is no pain or other such physical findings, and treatment is applied for the purpose of maintaining and enhancing health

[Observations]

KOMCL was established within Kuretake College in November 2007, with the mandate to engage in the clinical practice, research, and education of acupuncture. It has provided acupuncture treatment to members of women's collegiate lacrosse teams since its establishment, and has treated a total of 1,547 lacrosse players from April 2008 to March 2014.

Acupuncture is widely used for conditioning by sports athletes, but at KOMCL, importance is placed not only on treatment by acupuncture, but also on engaging athletes to perform active TR. This is because it is believed that strengthening physical strength through TR relatively lowers the exercise intensity of the sport, and helps prevent injury. On the other hand, the accumulation of fatigue from continued TR and sport activities is believed to heighten the risk of injury, so relieving fatigue is also an important issue. With regard to this point, previous studies suggest that AT is effective in relieving muscle fatigue and controlling the delayed onset of muscle soreness (3, 4, 5).

This was a successful case in which various treatment methods were effectively combined toward achieving the patient's goal after undergoing ACL reconstructive surgery, with the result that the patient's lack of muscle strength and motor functions were improved, performance was enhanced, and reinjury was prevented. The reason why the goal was ultimately able to be achieved was because the patient's information was shared between the medical institution and practice field from immediately after the injury, and the medical institution, KOMCL, and practice field were each able to make an input in their respective capacities based on an accurate understanding of the patient's condition. In Japan, many amateur sports lack an adequate medical support system, so most athletes who undergo surgery for ACL damage have few opportunities to receive specialized treatment other than functional recovery training at a medical

institution, and generally must strive to return to their sport after engaging only in self conditioning. Today, the development of social networks and cloud storage systems allows information about the movements of an athlete in the field to be shared with concerned parties who are not present on-site. Thus, it can be said that taking advantage of technology to achieve smooth sharing of information with medical institutions was a large factor in mitigating the patient's feeling of apprehension and allowing her to return to the sport.

The patient had received acupuncture treatment only once in the past, and had a strong resistance against AT from the beginning of TR. Therefore, only TR was conducted on the first to third treatment sessions, and AT was implemented only after she actually felt the effects of the TR and fostered a feeling of trust in the personnel in charge of AT. It appears that the patient's realization that receiving AT to actively relieve the fatigue from the TR would contribute to realizing her goal, prompted her to receive AT and undergo regular treatment even after completion of her TR program. Many young people tend to have a feeling of resistance to AT, but to strengthen their willingness to receive AT, it is important to share patients' goals and deepen their understanding that AT is effective in achieving those goals.

[Conclusion]

- 1. In order for us acupuncturists to help athletes who have sustained injury to return to their sport in the amateur sports world, which lacks an adequate medical support system, it is important to share information among medical institutions, acupuncture clinics, and the sport field, and take measures to ensure that medical cooperation can be continued.
- 2. In order for injured athletes to return to their sport, acupuncture treatment and other such passive treatment could be more effective when combined with exercise therapy and other active therapy.

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