J Acupunct Meridian Stud 2016;9(3):156–160

Available online at www.sciencedirect.com

Journal of Acupuncture and Meridian Studies

journal homepage: www.jams-kpi.com

CLINICAL CASE REPORT

Improvements in Scrotal Thermoregulation in Patients with Varicoceles Treated by Using Traditional Korean Medicine: Two Case Reports

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Available online 29 December 2015

Received: Oct 13, 2015
Revised: Nov 24, 2015
Accepted: Dec 1, 2015

KEYWORDS
acupuncture;
herbal medicine;
scrotal thermography;
traditional Korean medicine;
varicocele

Abstract
A varicocele is a dilatation of the pampiniform venous plexus within the spermatic cord. The incidence of varicoceles is 15%, and it occurs in more than 40% of men in infertile couples. Traditional Korean medicine (TKM) has been used to treat male infertility in Korea. We present two cases of men with varicoceles diagnosed *via* physical examination and scrotal thermography. We treated these men for two months by using TKM techniques, which included acupuncture, pharmacopuncture, and herbal medicine. We used scrotal thermography to evaluate the varicoceles before and after TKM treatment. After TKM treatment, the scrotal thermoregulation of both patients improved. In Patient 1, the temperature difference between the left and the right pampiniform plexus (i.e., ΔTP) was 2.8°C before treatment. It decreased to 1.3°C after treatment. In addition, the

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pISSN 2005-2901 eISSN 2093-8152
http://dx.doi.org/10.1016/j.jams.2015.12.001
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temperature difference between the testicles (ΔTT) was 1.5°C before treatment; it decreased to 0.2°C after treatment. In Patient 2, the ΔTP was 1.5°C before treatment; it decreased to 0.2°C after treatment. This report is the first to show that TKM may be an option for treating patients with varicoceles, as determined by using a scrotal thermography evaluation.

1. Introduction

A varicocele is a dilatation of the pampiniform venous plexus; it more commonly occurs among infertile men [1]. Varicoceles occur in 15% of men and in more than 40% of infertile couples [2,3]. A recent systematic review suggests that surgery or embolization may improve a couple's chances of conceiving. However, the level of this evidence is low, and more research is needed [4].

Physical examination, Doppler ultrasonography, venography, and contact thermography each test have an important role in diagnosing varicoceles [5]. Scrotal thermography is a useful diagnostic method, particularly for low-grade varicoceles; furthermore, it may be useful as a follow-up method for validating the success of surgery [6].

The major pathophysiological mechanism underlying impaired spermatogenesis in varicoceles is elevated scrotal temperature [6]. Acupuncture treatments have indicated that testicular temperature may be decreased by heat exchange in the pampiniform plexus [7]. *Cornu cervi pantotrichum* and *Calculus bovis-Fel ursi-Moschus* (BUM) pharmacopuncture therapies, which have exhibited antioxidant and anti-inflammatory activity, have been used to regulate kidney yin and yang and to stimulate the proper flow of *qi*, according to traditional Korean medicine (TKM). They have accordingly been used to treat male infertility and sexual dysfunction [8]. In addition, herbal remedies have been used to treat male infertility in Korea [9].

The present article reports two cases of varicoceles in men whose scrotal thermoregulation improved because of TKM therapies. To the best of our knowledge, this report is the first to demonstrate *via* scrotal thermography that TKM may be an option for men with varicoceles.

2. Case report

2.1. Participants

The institutional review board of Kyung Hee University Korean Medicine Hospital at Gangdong (Seoul, Korea) approved this retrospective, observational study; the requirement of patient approval or informed consent for the review of medical records was waived (approval number, KHNMCOH 2014-06-004).

Two patients with varicoceles received outpatient care at Conmaul Hospital (Seoul, Korea) between January and May 2014. Neither patient experienced symptoms related to the varicoceles or had undergone previous surgeries. A sperm test was recommended by the first author; however, both patients refused the sperm test.

2.1.1. Patient 1

Patient 1 was a 36-year-old man who had unsuccessfully attempted to impregnate his wife for 6 months. His varicocele was palpable by physical examination when standing without performing the Valsalva maneuver (i.e., varicocele grade 2). Patient 1 received four acupuncture treatments and pharmacopuncture, and he had received herbal medicine for 1 month before being reassessed by scrotal thermography (Fig. 1B). After an additional three rounds of acupuncture and pharmacopuncture, and an additional

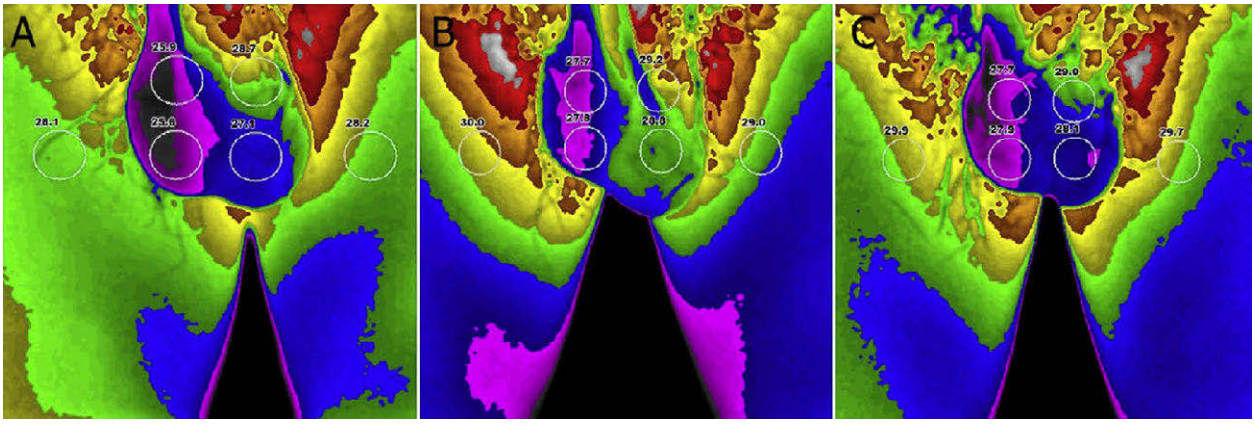

Figure 1 The scrotal temperature distribution in the left varicocele of Patient 1. (A) before treatment, (B) 4 weeks after treatment, and (C) 8 weeks after treatment. The asymmetric pattern demonstrates elevated temperature in the left hemiscrotum before treatment, which subsided after the traditional Korean medicine treatment.

month of herbal medicine, he was again reassessed by scrotal thermography (Fig. 1C).

2.1.2. Patient 2

Patient 2 was a 37-year-old man who had unsuccessfully attempted to impregnate his wife for 42 months. His varicocele was not palpable after performing the Valsalva maneuver (i.e., subclinical). Patient 2 received nine rounds of acupuncture and pharmacopuncture, and he had received herbal medicine for 2 months; he was then reassessed by scrotal thermography (Fig. 2B).

2.2. Scrotal thermography

We used scrotal thermography to evaluate the varicoceles. To record the measurements, we used a digital infrared camera (L3 Communications Holdings, Inc., New York, NY, USA) with a temperature sensitivity variance of 0.05°C. Before performing thermographic imaging, the patients spent 5 minutes in a room (24—25°C) undressed. The patients stood and held their penises against their abdominal walls with one hand [6]. The camera was placed approximately 30 cm from the scrotum. We obtained one image from each patient. Their scrotal temperatures are depicted in Figs. 1A and 2A. The varicoceles were diagnosed, based on diagnostic parameters outlined in a previous study [6].

2.3. Treatments

Both patients received acupuncture, pharmacopuncture, and herbal medicine treatments for 2 months. Acupuncture and the pharmacopuncture treatments were both provided once weekly on the same day. Acupuncture needles (0.25 mm in diameter and 40 mm in length; Dong Bang, Boryeong-si, South Chungcheong, Republic of Korea) were manually applied to a depth of 15—20 mm, depending on the region of the body at which the needles were inserted. The needles were rotated manually to evoke the *Deqi* sensation. Based to a previous study on male infertility [10], the following acupoints were chosen: SP6 (bilateral), KI3 (bilateral), LR3 (bilateral), ST29 (bilateral), SP10 (bilateral), CV4, and CV6. Electrical stimulation was applied at 10 Hz for 10 minutes at ST29 (bilateral) to increase testicular blood flow [9]. Acupuncture was maintained for 20 min.

Pharmacopuncture consisting of distilled *Cervi pantotrichum cornu* was applied in a volume of 0.1 mL into BL23 and BL33 (both bilaterally). BUM, in a volume of 0.2 mL, was applied into CV1 using a sterile insulin syringe (29 gauge and 1/2 inch, Shinchang, Gyeongsangbuk-do, Republic of Korea). The *Cervi pantotrichum Cornu* and BUM pharmacopuncture solution were prepared in a laboratory at the Korean Pharmacopuncture Institute (Seoul, Korea).

The herbal medicine was a decoction of *Salviae miltiorrhizae* Radix (14 g), *Cistanches Herba* (8 g), *Cuscuta chinensis* Lam. (8 g), *Lycium chinense* Mill. (8 g), *Cornus officinalis* Sieb. (12 g), *Morinda officinalis* How (8 g), *Epimedium koreanum* Nakai (8 g), *Rehmannia glutinosa* Libosch. (7 g), *Dioscoreae rhizoma* (7 g), *Spatholobi caulis* (7 g), *Angelica gigas* Nakai (7 g), *Astragali radix* (5 g), *Achyranthes japonica* Nakai (4 g), *Rubus coreanus* miq. (4 g), *Persicae semen* (4 g), *Carthamus tinctorius* L. (4 g), *Cinnamomi ramulus* (4 g), *Paeonia suffruticosa* Andr. (4 g), *Poria cocos* Wolf (4 g), *Alisma canaliculatum* All. (4 g), *Schisandra chinensis* Baillon (4 g), *Cnidium officinale* Makino (4 g), and *Plantago asiatica* L. (4 g).

Each plant material was mixed and decocted with purified water. This herbal remedy was administered three times daily after each meal. The patient did not receive any conventional treatments while receiving the aforementioned three treatments. The acupuncture, pharmacopuncture, and herbal medicine treatments were administered by a doctor of Korean medicine with 5 years of clinical experience.

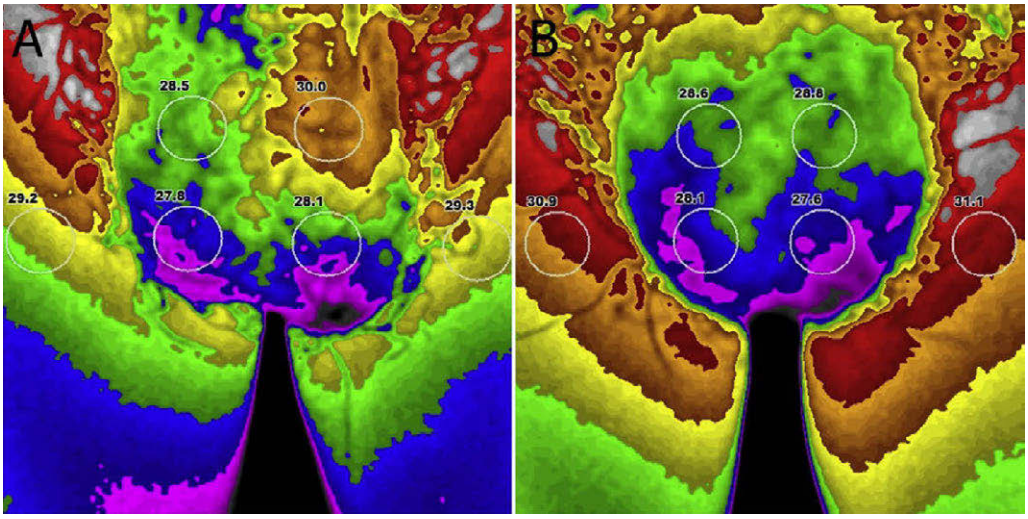

Figure 2 The scrotal temperature distribution in the left subclinical varicocele of Patient 2. (A) Before treatment and (B) 8 weeks after treatment. The asymmetrical pattern demonstrates elevated temperature in the left pampiniform plexus before treatment (A), which subsided after traditional Korean medicine treatment (B).

Table 1 The scrotal temperatures of both patients before and after traditional Korean medicine therapies.

		Before TKM therapies (°C)	After TKM therapies (°C)
Patient 1	ΔTP	2.8	1.3
	ΔTT	1.5	0.2
Patient 2	ΔTP	1.5	0.2
	ΔTT	0.3	0.5

TKM = traditional Korean medicine; ΔTP = temperature difference between the left and right pampiniform plexi; ΔTT = temperature difference between the testicles.

2.4. Results

The scrotal thermography results before and after TKM therapies (including acupuncture, pharmacopuncture, and herbal medicine) are presented in Table 1.

2.4.1. Before treatment

The temperature of the left hemiscrotum was elevated in Patient 1. The temperature difference between the left and right pampiniform plexi (i.e., ΔTP) was 2.8°C, and the temperature difference between the testicles (ΔTT) was 1.5°C. The temperature of the left pampiniform plexus was elevated in Patient 2. The ΔTP was 1.5°C. Two patients were diagnosed with left varicoceles using the standard proposed by Kulis et al [6].

2.4.2. After treatment

After treatment, the scrotal temperatures of both patients were within the normal range [6]. In Patient 1, the ΔTP was 2.8°C before treatment; it decreased to 1.3°C after treatment. In addition, the ΔTT was 1.5°C before treatment; it decreased to 0.2°C after treatment. In Patient 2, the ΔTP was 1.5°C before treatment; it decreased to 0.2°C after treatment. No adverse events were observed during treatment.

3. Discussion

This study described two cases of TKM therapies that combined acupuncture, pharmacopuncture, and herbal medicines to treat patients with varicoceles. We observed that TKM therapies may improve scrotal thermoregulation in these patients.

Acupuncture and herbal medicine have traditionally been used to treat infertile men in Korea. However, no published studies have examined the use of TKM therapies to treat varicoceles. Varicoceles are related to kidney deficiency and blood stasis in TKM. The term "kidney" embraces more functions than the concept of the kidney organ in Western medicine. The acupuncture and herbal medicine used in the current study boost "kidney" deficiency and blood circulation.

We used acupuncture points and electrical stimulation on ST29, based on previous studies [7,11]. These points are related to the spleen, liver, and kidney meridians, which theoretically govern reproductive functions, according to TKM. The exact mechanism underlying acupuncture treatment for varicoceles is not fully understood; however, enhancing the blood supply in the testicular arteries, decreasing testicular temperature by heat exchange in the pampiniform plexus, and stimulating systemic immune-regulatory actions have been suggested as possibilities [7,12].

The herbal medicines prescribed in the current study are also effective for patients with varicoceles and poor semen quality. *Cornus officinalis* Sieb. Et Zucc, *Schizandra chinensis* Baillon, *Rubus coreanus* Miquel, *Cuscuta chinensis* Lam., and *Lycium chinense* Mill. are popular TKM herbs used in infertile men. These herbal medicines may refresh kidney yin and yang, according to TKM. Their effects may be related to their antioxidant properties, which may help to reverse imbalances because of excessive levels of reactive oxygen species [13]. *Salviae miltiorrhizae* Radix and *Carthamus tinctorius* L. are important for stimulating blood circulation, which they promote by reversing blood stasis [14].

The temperature of the left hemiscrotum was elevated in Patient 1 before TKM; by contrast, the temperature of only the left pampiniform plexus was elevated in Patient 2 before TKM. In addition, Patient 1 exhibited a more prominent varicocele than Patient 2, based on the results of each patient's physical examination. These varicocele temperature patterns have been suggested as diagnostic tools in the detection of varicoceles, which tend to progress and impair semen quality [15]. Regardless of whether hyperthermia secondary to varicoceles affects the testicles, both patterns may have been improved by the TKM treatments described in this study.

Scrotal thermoregulation was improved; however, the sperm was not evaluated before or after treatment because the patients refused. In addition, the varicocele of Patient 2 was not evaluated by scrotal ultrasound or color Doppler examination, but it was diagnosed by infrared digital thermography. In addition, neither patient successfully impregnated his female partner during the two-month treatment period. Therefore, we do not know whether the TKM treatment had a positive effect on semen quality. However, it is a possibility, given the positive effects on semen quality exerted by decreasing scrotal temperature and improving thermoregulation, as demonstrated in a previous study [7]. Therefore, long-term follow up is necessary to verify the results, as it often takes time to become pregnant, even for couples with normal fertility [16]. In addition, factors involving the patients' female partners cannot be fully excluded with respect to post-treatment pregnancy. Furthermore, how long after treatment the scrotal temperature should be maintained to be considered decreased needs to be determined.

Despite these limitations, this study is important because it presents the first case reports describing the treatment of men with varicoceles using TKM therapies. Additional large-scale, randomized, controlled trials with elaborate designs should be performed to verify the clinical effects of TKM therapies.

Disclosure statement

The authors have no conflicts of interest or financial interests to declare related to the materials in this manuscript, and have received no financial support for this work.

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