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CASE REPORT

Managing Chronic Kidney Disease and Chemotherapy-Induced Peripheral Neuropathy with Acupuncture and Herbal Medicine: A Case Study

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Abstract
This case study details the treatment of a 59-year-old male with Stage 3B chronic kidney disease (CKD) and chemotherapy-induced peripheral neuropathy of the left limbs using acupuncture and bulk herbs. After 6 weeks of combined acupuncture and herbal treatments, glomerular filtration rate increased significantly from 37 mL/min to 51 mL/min and serum creatinine level decreased from 1.85 mg/dL to 1.41 mg/dL. After a course of 15 acupuncture treatments over 4 months with some appointments in closer proximity, the patient additionally reported increased sensation of his left limbs. Since there are limited treatments for CKD, others with CKD may benefit from acupuncture and herbal treatments. This study offers an approach to managing CKD and chemotherapy-induced peripheral neuropathy more effectively using herbs and acupuncture supported by biomedical verification results.

1. Introduction

Chronic kidney disease (CKD) is considered to be a global health problem [1]. The numbers of CKD patients with a corollary of end-stage renal disease have increased in all countries [2]. As CKD progresses, uremia, high blood pressure, anemia, bone disease, poor nutritional health, and nerve damage may develop [1]. CKD is commonly associated with cardiovascular disease and diabetes where cardiovascular disease is both a cause and a complication of CKD [3]. Recent studies have found that complications and comorbidities occur more commonly with CKD [4,5] CKD is a risk factor for adverse outcome of cancer [3,4]. Cancer can cause CKD either directly or indirectly through adverse effects of cancer therapies and CKD may conversely be a risk factor for cancer [4,5].

The National Kidney Foundation defines CKD as "kidney damage for three or more months as defined by structural

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or functional abnormalities of the kidney, with or without decreased glomerular filtration rate (GFR) or estimated GFR < 60 mL/min/1.73 m^2 for 3 or more months, with or without kidney damage" [1]. The normal range for GFR is 90–120 mL/min. The GFR decreases with age and is essential for the diagnosis and management of CKD. There are five stages of CKD: Stage 1, GFR > 90 mL/min/1.73 m^2 (normal); Stage 2, GFR 60–89 mL/min/1.73 m^2 (mild); Stage 3, GFR 30–59 mL/min/1.73 m^2 (moderate); Stage 4, GFR 15–29 mL/min/1.73 m^2 (severe); and Stage 5, GFR < 15 mL/min/1.73 m^2 (kidney failure) [1]. The level of serum creatinine is another indicator of renal function. Creatinine is a byproduct generated from muscle metabolism, removed from the blood and excreted by the kidneys [1]. A creatinine level > 1.4 mg/dL for men may indicate kidney dysfunction [1].

Chemotherapy-induced peripheral neuropathy (CIPN) occurs in 20–100% of patients with cancer and is a direct result of sensory, motor, and autonomic nerve injury [6,7]. CIPN commonly includes uncomfortable and often painful sensations described as burning, numbness, stabbing, pricking, tingling, sharpness, shooting, or electric-shock-like [6]. In most cases, neuropathy signs and symptoms first become apparent in the toes [8]. Symptoms progress proximally from the toes to the feet, ankles, and then calves [8]. Extension to the fingers, hands, wrists, and then arms indicates severe neuropathy and usually occurs after CIPN has been well-established in the lower extremities [9].

Acupuncture and herbs may help manage CKD and subsequently be helpful in managing CIPN [10]. From the view of East Asian medicine (of promoting physiological function), by strengthening and regulating postnatal (Spleen/Stomach) and prenatal (Kidney) *qi*, the body is able to provide increased perfusion of *qi* and blood to the extremities. Studies of *Dang gui* and *Huang qi* show that these two herbs can lower proteinuria, retarding the progression of renal fibrosis [10–12]. Studies showed that acupuncture decreased sympathetic nerve activity in the kidneys, and lowered serum creatinine and blood pressure through modulation of endothelial nitric oxide [13,14].

2. Case Presentation

A 59-year-old male patient presented with the chief complaints of CKD and CIPN of the left hand and leg on December 19, 2013. In 2012, he was diagnosed with decreased kidney function and borderline CKD with a GFR < 60 mL/min. Previously, he had been diagnosed with colorectal cancer in 2008 and underwent a colectomy, reconstructive surgery of the left ureter and chemotherapy. He had been in remission since his last chemotherapy in 2010. He has a family history of hypertension and was diagnosed with stage 1 hypertension prior to the cancer diagnosis. The patient's main concern was declining kidney function which would require hemodialysis. He had started graduate school shortly after finishing chemotherapy treatment and was concerned that he would not be able to finish graduate school with worsening symptoms. The onset of neuropathy started on the sole of his left foot, which preceded neuropathy of his left hand. At first, he experienced numbness and tingling on his left sole. Subsequently, his left hand felt considerably weak and numb, especially on the palmar aspect. He reported that the numbness and weakness had adversely affected activities of daily living such as opening bottles. To alleviate CIPN and other chemotherapy-related side effects, he began receiving acupuncture treatments in 2011. Previously, the patient was also prescribed *Jin Gui Shen Qi Wan*, a common Kidney *yang* tonic formula modified from *Liu Wei Di Huang Wan* with the addition of *Gui zhi* and *Fu zi*. However, the patient reported previous treatments did not improve kidney function.

Table 1 Pre-treatment and post-treatment urinalysis results after 6 weeks of combined herbal (Dang Gui Bu Xue Tang) and acupuncture treatments.

Urinalysis measurements	Pre-treatment	Post-treatment	Change in value
Glomerular filtration rate (mL/min)	37	51	+ 14
Creatinine (mg/dL)	1.85	1.41	− 0.44

The patient complained of somnolence, fatigue, coldness, poor memory, fecal incontinence, tinnitus, and erectile dysfunction, which points to Kidney *yang* deficiency [15]. On palpation, his hands and feet felt colder than other areas of his body. The right distal and middle pulse positions were slippery, and the proximal position was weak and thin. The left pulse was choppy on all three positions with the proximal position thin and choppy. His tongue was pale dusky with a red tip, cracks on the side and in the center, and a dry thick white coat. The sublingual veins were dark and slightly distended, the left side more distended than the right. After his last urinalysis in October 2013, his primary care physician prognosed that the patient would need hemodialysis in the following year. The patient agreed to get a urinalysis in January 2014 to establish a new baseline before taking herbal medicine. The urinalysis revealed GFR of 37 mL/min and creatinine level of 1.85 mg/dL or stage 3B CKD.

From December 19, 2013 to March 25, 2014, the patient was treated 15 times using a modified Korean four-needle (SaAm) technique with LU9 and SP3 to move blood combined with ST36, KID-3, TE4, CV6, *Yintang* EX-HN3, and GV20 to strengthen *qi* as presented in Table 2. Each treatment lasted 30–40 minutes with insertion always starting on the right side so the patient could compare the needling sensations between the right and left. Single disposable stainless steel needles with a wire spiral handle with loop, guide tube, 36 gauge (20 mm), 2.5-cm

Table 2 Selection of acupuncture points.

Area of body	Acupuncture points and Insertion order		
(1) Right limbs	LU9	SP3	
(2) Bilateral (right to left)	ST36	KI3	TE4
(3) Midline	CV6	*Yintang* EX-HN3	GV20

needles (Millennia acupuncture needles, UPC Medical, China) were used. Since the patient usually felt cold, two infrared lamps, one directed on his lower abdomen and the other on his feet, were also used during the acupuncture treatments.

The patient started to gain sensation of his left hand at TE4 during the sixth acupuncture treatment and he began feeling needling sensation on his left leg at ST36 during the seventh treatment. During the course of 15 treatments, the sensation on his fingertips gradually increased, starting with the second and third fingers. The patient began taking *Dang Gui Bu Xue Tang* after the fifth acupuncture session using the latest urinalysis results to establish a baseline (GFR 37 mL/min and creatinine 1.85 mg/dL) for measuring changes in kidney function. He took *Dang Gui Bu Xue Tang* three times a day after meals, using the classical dosage of *Huang qi* 30 g and *Dang gui* 6 g for 6 weeks. Six weeks later, he had another urinalysis test and the results were GFR of 51 mL/min and creatinine level of 1.41 mg/dL. His GFR had been declining in the past 2 years and this was the first time the GFR increased. However, after 15 sessions, treatments were discontinued due to the author's relocation.

3. Discussion

The patient's CKD may be associated with the combination of hypertension, colorectal cancer, the adverse effects of chemotherapy and surgery. Since the patient's kidney function was compromised, care was taken to avoid using herbs that would further overload and damage the kidneys [16]. Previously, the patient received herbal treatments that focused on tonifying Kidney *yang*. Instead of primarily focusing on tonification, the treatment focused first on removing stagnation and improving circulation using a modified Korean four-needle technique of strengthening the metal element by tonifying lung and spleen *qi* with LU9 and SP3 which in turn controls the wood element (liver *qi* stagnation) and supports the postnatal aspect. Since the pulse and tongue indicated *qi* stagnation and blood stasis, LU9 and SP3 were selected to strengthen (postnatal) *qi* in order to resolve stagnation. The herbal treatment strategy of tonifying *qi* and blood by using *Dang Gui Bu Xue Tang* which consists of only two herbs, *Huang qi* and *Dang gui*, may have yielded better results after stagnation was resolved with acupuncture as seen in the positive measurable physiological changes. The significant improvement in the patient's GFR shows promise in using herbs with nephroprotective actions such as *Huang qi* and *Dang gui* for CKD patients [11,12]. The patient's GFR baseline value was 37 mL/min, which is staged as 3B CKD (moderate to severe; range, 30—44 mL/min) and improved significantly with acupuncture and herbal treatment to 51 mL/min, which is staged as 3A (mild to moderate; range, 44—59 mL/min; Table 1).

It is likely that the treatment principle of resolving stagnation while supporting postnatal *qi* was more effective than direct supplementation confirmed by the improved laboratory values. Since he started taking the herbs after the fifth treatment, the improvements in neuropathy can be attributed mainly to the acupuncture treatments. Given the presentation of Kidney *yang* deficiency, it is unclear why *Jin Gui Shen Qi Wan* was not as effective in comparison to *Dang Gui Bu Xue Tang*. Further investigation into the biodynamics of single herbs and herbal formulas that are safe and effective for managing CKD is warranted [16]. Chemotherapy, other drugs, and surgery can complicate the diagnosis with concurrent damage to both the pre- and postnatal aspect [17]. Studies have shown the adverse effects of cancer therapies resulting in CKD as in the case of this patient [4,5]. Studies have also shown that supporting postnatal *qi* along with prenatal *qi* improves the remission rates from cancer and helps alleviate the side effects from cancer therapies more effectively than without the support [17]. As CKD and CIPN are becoming increasingly more prevalent, East Asian medicine may provide valuable, cost-effective, safe, and effective nonpharmaceutical approaches to ameliorate and stabilize CKD and CIPN symptoms to improve quality of life.

Disclosure statement

The author declares no conflicts of interest and no financial interests related to the material of this manuscript.

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