

Traditional Chinese Medicine in Dry Eye Disease

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1 Introduction

Dry eye disease is a lacrimal film abnormality caused by decreased lacrimal secretions, or hyperactive lacrimal evaporation (DEWS, 2007). The condition is presented with symptoms of discomfort in the eye which may accompany other ocular surface diseases. If patients present only isolated symptoms of dry eyes, they may recover with rest or short-term use of artificial tears (Johnson ME & Murphy PJ, 2004). If there are no ocular surface damage and/or any other local or systemic causes present, it is termed 'simple dry eye'. If patients present both symptoms and clinical signs of dry eyes, it is termed 'dry eye disease'. With the increased usage of the computer and other IT gadgets in modern lifestyle, the incidence of dry eyes has gradually increased while the average age of onset is much lower than before. Dry eye disease imposes a significant direct health care burden and even more so indirectly (Waduthantri S *et al.*, 2012). Dry eye disease affects millions of people around the world with prevalence rates estimated to be as high as 35% in the general population (McCarty CA *et al.*, 1998).

Traditional Chinese Medicine (TCM) is a holistic system of healthcare developed by the Chinese and has been practiced for thousands of years. The first record of TCM is dated back to 2000 years ago in the Yellow Emperor's Cannon of Internal Medicine (*Huang-di nei jing*). Over the years, Chinese medicine is developed from the foundations laid in the Yellow Emperor's Cannon of Internal Medicine, however the core values of TCM never deviated from it, that is, (1) holistic treatment: to look at a disease holistically and treat from the disease roots, while addressing the symptoms; (2) strengthening the body's resistance (*zheng qi*) and dispelling pathogenic factors (*xie qi*), and (3) personalization of treatment based on environmental factors and individual constitution.

There are various modalities of treatment in TCM, including acupuncture, herbal remedies, massage (*tui na*), cupping, moxibustion, ear acupuncture and scraping (*gua sha*). The most commonly employed methods today are acupuncture, herbal remedies and massage, although massage is mostly used for relaxation than its healing functions today. Acupuncture is the insertion of needles into the skin or even the tongues and mucosal layer, based on the system of meridians and its connectivity to the various organs deep in the human body. A modification to the ancient technique of acupuncture is the development of electro stimulation, where needles are connected to weak pulses of electricity for increased stimulation of the acupoints. Herbal remedies are usually prescribed in the form of decoctions, although pills, pastes and baths are also available. Herbal remedies could be based on a single herb or a combination of a few or many, depending on the individual constitution, and modification of the remedies

is commonly done. The principle of all modalities of treatment would be to eliminate pathogenic forces, while restoring the body's balance and strengthening it.

In Chinese medicine, the disease pertains to *bai se zheng* (白涩症, white dry eyes), or *shen shui jiang ku* (神水将枯, impending desiccation of spirit water), belonging to the category of *zao zheng* (燥症, dryness pattern) (Ping WQ). The causes are mostly attributed to lung *yin* deficiency or liver and kidney *yin* deficiency, which lead to nutritional deficiency of the eyes.

2 Clinical Manifestation of Dry Eye Disease

Common ocular symptoms include asthenopia (eye strain), sensation of foreign bodies in the eyes, dryness, burning sensation, swelling, ophthalmalgia (pain in eye), photophobia, redness, etc. If these symptoms are presented, patients should be asked in detail on their history of dry eyes sensation in order to find the underlying causes. For patients who present with severe dry eyes, the clinician should check if their condition is accompanied by dry mouth or joint pain, as the dry eye symptoms could be an indication of Sjögren's Disease and require prompt treatment. Clinical signs of dry eye include vasodilatation, edema, folding of bulbar conjunctiva, shortened tear meniscus height (TMH), and occasional mucopurulent discharge in the lower fornix and punctate staining in corneal epithelium in the palpebral fissure area. When dry eye disease is suspected, relevant objective tests may be considered, including Schirmer's test and tear break up time (TBUT) test.(Tong L *et al.*, 2012) Dry eyes may affect visual acuity in early stages, and further develop into filamentary keratitis. At later stages, if left untreated, dry eye disease may lead to corneal thinning, ulcers, and perforation, or in some cases, a secondary bacterial infection.

2.1 Types of Dry Eye Patterns in TCM

In most patients presenting with dry eye, their disease condition could be attributed to one or a combination of five main categories of 'disease pattern'. These disease patterns are identified as pathologies stemming from the 'organs', or the root of the disease, and usually present overlapping symptoms apart from dry eye. These patterns include deficiency of lung *yin*, deficiency of liver and kidney *yin*, and dry eye initiated by heat in various organs. These will be described in the sections below:

2.1.1 Deficiency of Lung Yin

Patients in this category often present with the following characteristics: Dry eyes that result in inability to see clearly over a long period, mild conjunctiva hyperemia, point lesions of the superficial corneal layer, relapses with poor recovery, dry cough with little phlegm, dry pharynx, constipation, reddish tongue with dry mouth and a thready rapid pulse.

The treatment in this case is to enrich yin and moisten the lung meridian. A representative formula is the Yang Yin Qing Fei Tang (养阴清肺汤, yin-nourishing lung-clearing decoction). (Wei Q-P *et al.*, 2011) Refer to Table 1 for the prescription. Please note that this prescription is often modified in 3 scenarios:

- For cases with pronounced dry throat and mouth, add *bei sha shen* (北沙参, *Glehnia littoralis* Fr. Schmidt ex Miq.) 15g, *Shi Hu* (石斛, *Dendrobium loddigesii* Rolfe.) 10g to boost the *qi* and nourish the *yin*.
- For cases with constipation, add *jue ming zi* (决明子, *Cassia obtusifolia* L.) 15g to moisten the intestines and allow the stool to move down the rectum.
- For cases with point lesions of the cornea, add *chan tui* (蝉蜕, *Cryptotympana pustulata* Fabricius) 6g, *ju hua* (菊花, *Chrysanthemum morifolium* Ramat.) 12g, *mi meng hua* (密蒙花, *Buddleja officinalis* Maxim.) 10g to clear the heat, and brighten the eyes.

Herb	Chinese character	Latin name	Amount
<i>Mu dan pi</i>	牡丹皮	<i>Paeonia suffruticosa</i> Andr.	10 g
<i>Bai shao</i>	白芍	<i>Paeonia lactiflora</i> Pall.	10 g
<i>Sheng gan cao</i>	生甘草	<i>Glycyrrhiza uralensis</i> Fisch	10 g
<i>Sheng di</i>	生地	<i>Rehmannia glutinosa</i> Libosch.	10 g
<i>Bo he</i>	薄荷	<i>Metha haplocalyz</i> Briq.	6 g
<i>Xuan shen</i>	玄参	<i>Scrophularia ningpoensis</i> Hemsl.	10 g
<i>Mai dong</i>	麦冬	<i>Ophiopogon japonicus</i> (L.f.) Ker-Gawl.	15 g
<i>Bei mu</i>	贝母	<i>Fritillaria thunbergii</i> Miq.	10 g
<i>Tai zi shen</i>	太子参	<i>Pseudostellaria heterophylla</i> (Miq.)	15 g
<i>Wu wei zi</i>	五味子	<i>Schisandrae chinensis</i> (Turez.) Baill.	10 g

Table 1: Prescription for *Yang Yin Qing Fei Tang* (yin-nourishing lung-clearing decoction)

2.1.2 Liver and Kidney Yin Deficiency

In this syndrome, dry eye is accompanied with symptoms of ocular discomfort, photophobia, and dry mouth with scant saliva, lumbago, weak and/or painful knees, dizziness, tinnitus, insomnia with profuse dreams, red tongue with thin coating and a thready pulse.

The treatment principle is to nourish the liver and kidney meridians, and a representative formula is the Modified Qi Ju Di Huang Wan (杞菊地黄丸, lycium berry, chrysanthemum and rehmannia pill) (Table 2). In certain scenarios, this formulation can be modified:

- For cases with dry mouth, with scanty saliva, add *mai dong* (麦冬, *Ophiopogon japonicus* (L.f.)Ker-Gawl.) 10g, *xuan shen* (玄参, *Scrophularia ningpoensis* Hemsl) 10g to nourish the *yin* and engender the fluid.
- For cases with obvious conjunctival hyperaemia, add *sang bai pi* (桑白皮, *Morus alba* L.) 9g, *di gu pi* (地骨皮, *Lycium chinensis* Mill.) 10g to clear the heat and reduce congestion.

2.1.3 Dry Eye Initiated by Wind and Heat

This type of dry eye is caused by wind and heat, including xerosis conjunctiva, fulminant red eye with acute meibula and conjunctival edema. The principle of treatment is to ‘scatter’ the wind and clear the heat. The representative formula is *Sang Ju Ying* (桑菊饮, Mulberry leaf and chrysanthemum beverage (Table 3).

Herb	Chinese character	Latin name	Amount
<i>Gou qi zi</i>	枸杞子	<i>Lycium barbarum L.</i>	15 g
<i>Ju hua</i>	菊花	<i>Chrysanthemum morifolium Ramat.</i>	10 g
<i>Shu di</i>	熟地	<i>Rehmannia glutinosa Libosch.</i>	10 g
<i>Shan zhu yu</i>	山茱萸	<i>Cornus officinalis Sieb.et Zucc.</i>	10 g
<i>Shan yao</i>	山药	<i>Dioscorea opposita Thunb.</i>	10 g
<i>Ze xie</i>	泽泻	<i>Alisma orientalis (Sam.) Juzep.</i>	10 g
<i>Fu ling</i>	茯苓	<i>Poria cocos (Schw.) Wolf</i>	10 g
<i>Mu dan pi</i>	牡丹皮	<i>Paeonia suffruticosa Andr.</i>	10 g

Table 2: Prescription for Modified Qi Ju Di Huang Wan.

Herb	Chinese character	Latin name	Amount
<i>Sang ye</i>	桑叶	<i>Morus alba L.</i>	9 g
<i>Ju hua</i>	菊花	<i>Chrysanthemum morifolium Ramat.</i>	9 g
<i>Lian qiao</i>	连翘	<i>Forsythia suspense (Thunb.) Vahl.</i>	9 g
<i>Ju geng</i>	桔梗	<i>Platycodon grandiflorum (Jaoq.) A.DC.</i>	9 g
<i>Xing ren</i>	杏仁	<i>Prunus armeniaca L.var.ansu Maxim.</i>	9 g
<i>Ze xie</i>	泽泻	<i>Alisma orientalis (Sam.) Juzep.</i>	6 g
<i>Gan cao</i>	甘草	<i>Glycyrrhiza uralensis Fisch</i>	3 g
<i>Lu gen</i>	芦根	<i>Phragmites communis (L.) Trin.</i>	15 g

Table 3: Formulation for Mulberry Leaf and Chrysanthemum Beverage.

2.1.4 Dry Eye Initiated by Heart-heat

This is dry eye initiated by overwork from prolonged use of computers, insufficient sleep or stress-induced insomnia, and usually presents with photophobia, eye strain, eye sore or pain, with red tongue tip and rapid pulse. In this scenario, the treatment principle is to clear the heart-heat from the heart meridian by promoting urination. A representative formulation to address this is found in Table 4.

Herb	Chinese character	Latin name	Amount
<i>Sheng di</i>	生地	<i>Rehmannia glutinosa Libosch.</i>	18 g
<i>Mu tong</i>	木通	<i>Aristolochia manshuriensis Kom.</i>	9 g
<i>Dan zhu ye</i>	淡竹叶	<i>Lophatherum gracile Brongn.</i>	12 g
<i>Shan zhi zi</i>	山梔子	<i>Gardenia jasminoides Ellis</i>	12 g
<i>Huang bai</i>	黄柏	<i>Phellodendron amurense Rupr.</i>	9 g
<i>Zhi mu</i>	知母	<i>Anemahena asphodeloides Bge.</i>	9 g
<i>Deng xin cao</i>	灯芯草	<i>Juncus effuses L.</i>	6 g
<i>Gan cao</i>	甘草	<i>Glycyrrhiza uralensis Fisch</i>	6 g

Table 4: Treatment to reduce heat in the heart – formulation of dao chi san.

2.1.5 Dry Eye Initiated by Liver- heat

Heat can also be initiated by the liver. In this syndrome, dry eye is initiated by prolonged visual tasks, and the patients in this category are stressed and easily agitated or frustrated with dry eye with headache. He also suffers from pain in the side abdomens at times, has red tongue with white coat and a rapid thready pulse.

Here, the physician aims to clear the liver heat and dampness from the lower part of the body meridians. A formulation such as that in Table 5 can be employed.

Herb	Chinese character	Latin name	Amount
<i>Long dan cao</i>	龙胆草	<i>Gentiana scabra</i> Bge.	12 g
<i>Sheng di</i>	生地	<i>Rehmannia glutinosa</i> Libosch.	18 g
<i>Dang gui</i>	当归	<i>Angelica sinensis</i> (Oliv.)	6 g
<i>Chai hu</i>	柴胡	<i>Bupleurum chinensis</i> DC.	6 g
<i>Mu tong</i>	木通	<i>Aristolochia manshuriensis</i> Kom.	9 g
<i>Ze xie</i>	泽泻	<i>Alisma orientalis</i> (Sam.) Juzep.	9 g
<i>Che qian zi</i>	车前子	<i>Plantago asiatica</i> L.	9 g
<i>Shan zhi Zi</i>	山梔子	<i>Gardenia jasminoides</i> Ellis	9 g
<i>Huang qin</i>	黄芩	<i>Scutellaria baicalensis</i> Georgi.	9 g
<i>Gan cao</i>	甘草	<i>Glycyrrhiza uralensis</i> Fisch	5 g

Table 5: Formulation for treatment of liver heat - long dan xie gan tang.

3 TCM Treatments of Dry Eye

3.1 Acupuncture Treatment for Dry Eye

The history of using acupuncture treatment for dry eye is dated back to the Ancient Times – Northern and Southern Dynasties (581A.D). The Yellow Emperor’s Inner Classic (*Huang Di Nei Jing*, 黄帝内经) had records of the anatomy and physiology of the eyes, as well as the etiology, pathology, clinical manifestation, and acupuncture strategies for eye disorders (Wei Q-P *et al.*, 2011). More than 30 eye diseases were recorded in this book. In each typical treatment session, 4 – 6 acupoints were selected, needles retained for 20 – 30 minutes, and treatment was performed once every day. Ten treatments constitute one course of treatment(Wei Q-P *et al.*, 2011) (Table 6). Most studies conducted previously did not have proper control groups. Recently, investigators in Korea have conducted randomized controlled studies in acupuncture compared to sham acupuncture.(Shin MS *et al.*, 2010) The results show that compared to patients on sham acupuncture, the acupuncture patients have improved tear break up time, Schirmer’s tests and corneal fluorescein staining at 3 weeks after treatment.

ST1 (<i>cheng qi</i>) 承泣	太阳 (<i>tai yang</i>)	GB20 (<i>feng chi</i>) 风池
BL2 (<i>cuan zhu</i>) 攒竹	鱼腰 (<i>yu yao</i>)	SJ 23 (<i>si zhu kong</i>) 丝竹空
ST2 (<i>si bai</i>) 四白	LV3 (<i>tai chong</i>) 太冲	GB37 (<i>guang ming</i>) 光明
SP6 (<i>san yin jiao</i>) 三阴交	LI4 (<i>he gu</i>) 合谷	DU23 (<i>shang xing</i>) 上星
DU20 (<i>bai hui</i>) 百会		

Table 6: Acupuncture points for treatment of dry eye.

Commonly used Acupoints in Dry Eye Syndrome are shown in the above table. Their locations and applications are as follows:

Acupoints around the eye (6 acupoints):

1. ST1 (*cheng qi*, 承泣): Between the infraorbital ridge and the eye ball, 0.7 cun (ancient Chinese measurement in inches) directly below the pupil when the eyes are looking straight ahead. Puncture perpendicularly 0.5 – 1.5 cun along the infraorbital ridge.
2. BL2 (*cuan zhu*, 攒竹): In the depression over the medial end of the eyebrow. Oblique puncture downward to a depth of 0.3 – 0.5 cun.
3. ST2 (*si bai*, 四白): 1 cun directly below the pupil, in the depression over the infraorbital foramen. Perpendicularly puncture for 0.2 – 0.3 cun.
4. Tai yang 太阳: In the depression about 1 cun behind the midpoint between the lateral end of the eyebrow and the outer canthus. Perpendicularly or obliquely puncture for 0.3 – 0.5 cun.
5. Yu yao 鱼腰: At the midpoint of the eyebrow, directly above the pupil. Horizontally puncture towards medial or lateral side for 0.5 cun.
6. SJ23 (*si zhu kong*, 丝竹空): In the depression over the tip of eyebrow. Horizontally puncture to 0.3 – 0.5 cun.

Relative body acupoints (7 acupoints):

1. SP6 (*san yin jiao*, 三阴交): On the medial side of the leg, 3 cun above the tip of the medial malleolus, posterior to the medial border of the tibia. Perpendicularly puncture to a depth of 0.5 – 1 cun. Moxibustion is applicable.
2. DU20 (*bai hui*, 百会): 7 cun directly above the midpoint of the posterior hairline. Horizontally puncture to a depth of 0.5 – 0.8 cun.
3. LV3 (*tai chong*, 太冲): On the dorsum of the foot between the 1st and 2nd toes, in the depression 1.5 cun to LR2. Perpendicularly puncture to a depth of 0.5 – 0.8 cun. Moxibustion is applicable.
4. LI4 (*he gu*, 合谷): In the depression between the first and second metacarpophalangeal joint. Perpendicularly puncture to a depth of 0.5 – 0.8 cun.

5. GB20 (feng chi, 风池): In the depression between the upper ends of the sternocleidomastoid and trapezius muscles, at the level of DU 16 (feng fu). Obliquely puncture 1 – 2 cun towards the fellow eye. Moxibustion is applicable.
6. GB37 (guang ming, 光明): 5 cun above the tip of the external malleolus, on the anterior boarder of the fibula. Perpendicularly puncture to a depth of 0.5 – 1 cun. Moxibustion is applicable.
7. DU23 (shang xing, 上星): 1 cun directly above the midpoint of the anterior hairline. Horizontally puncture to a depth of 0.5 – 0.8 cun. Moxibustion is applicable.

The principle of selecting acupoints in the practice of TCM ophthalmic acupuncture is based on diagnosis and pattern differentiations, usually using whole-body pattern differentiation combined with local acupoints to obtain the goal of supporting healthy qi, dispelling pathogens, relieving sickness by dredging the channels and collaterals, regulating zang-fu organs, and relating qi and blood. The essence of the five zang and six fu flow upward to the eyes. Therefore, all the pathological conditions of the zang, fu, qi, blood, channels and collaterals should be taken into consideration when making a pattern differentiation.

In TCM theory, all the vessels are related to the eyes. The eyes are abundant with channels; collaterals, qi and blood, and thus they may become vulnerable to disease. Therefore, needling the local acupoints around the eye can have a direct and rapid impact on relieving the symptoms. In clinical practice, we commonly select local acupoints around the eyes in combination with body acupoints to promote a whole treatment process.

Therefore for the dry eye syndrome, besides the local acupoints, different acupoints from different meridians – Spleen meridian (SP), Stomach meridian(ST), Liver meridian(LV), Gallbladder meridian (GB) will be selected accordingly, in completing the points selection.

3.2 Chinese Patent Medicines

In western or clinical medicine, patients with dry eye may be given lubricants such as 1% sodium hyaluronate or carboxymethylcellulose eyedrops used frequently daily. Patients with more severe or uncontrolled symptoms may seek advice or treatment from an Ophthalmologist, who may initiate immunosuppressive, anti-inflammatory treatment, or punctum occlusion methods.

In contrast, TCM advocates the use of simple remedies comprising core herbs such as ju hua (菊花, *Chrysanthemum morifolium* Ramat.), mai dong (麦冬, *O. japonicus*(L.f)Ker-Gawl) gou qi zi (枸杞子, *Lycium barbarum* L.), mu hu die (木蝴蝶, *Oroxylum indicum* (L.) Kurz) which possess yin-nourishing properties. Depending on the condition and constitution of the patients, a selection of herbs are added (10g each) into a prescription and wrapped as a tea drink. Alternatively, they are brewed in a teapot with boiling water, and consumed 6 – 9 times in small amounts daily, Chinese physicians may choose one of these more standard therapies:

1. Qi Ju Di Huang Wan (杞菊地黄丸, lycium berry, chrysanthemum and rehmannia pill) 6 pills, twice daily; applicable to liver-kidney yin deficiency
2. Zhi Bai Di Huang Wan (知柏地黄丸, Lycium berry, chrysanthemum and redmannia pill)6 pills, twice daily; applicable to liver-kidney yin deficiency or effulgent yin-deficiency

3. Yang Yin Qing Fei Kou Fu Ye (养阴清肺口服液, yin-nourishing lung-clearing oral liquid) 10ml, twice daily, applicable to deficiency of lung-yin deficiency

3.3 Dietary Therapy and Preventive Management

Like in all types of medicine, Chinese medicine recognizes that environmental and dietary factors contribute to disease. Therefore, preventive measures and ways to adjust the environment that one is exposed to maybe just as helpful as therapeutic medications.(Wei Q-P *et al.*, 2011) Some of these measures include:

- Avoiding prolonged and excessive visual tasks. Patients are counseled that TV, computers and other IT gadgets should be placed in a position below eye level.
- Avoidance of air conditioning and dust, and measures to maintain a certain degree of humidity in the room
- Adopting a positive attitude to life and have a happy outlook, paying particular attention to balanced and sufficient dietary components and maintaining a healthy eating habit including the consumption of fresh vegetables and fruits, while increasing vitamins A, B, C and E intake. The patients should be advised against over-consumption of spicy, greasy-fried, or fatty and processed food.
- Regulation of the internal emotions and working on cultivating an optimistic mood; maintaining a proper balance between work and relaxation.

4 Clinical Trials in Dry Eye

Sometimes, Tradition Chinese Medicine physicians employ a mixture of acupuncture and oral therapies. Recently, randomized controlled studies in the use of TCM in dry eye have been published, with data that suggest TCM is useful in improving the disease condition (Chang YH *et al.*, 2005; Gronlund MA *et al.*, 2004; Lee MS *et al.*, 2011; Nepp J, 2005; Nepp J *et al.*, 1998; Shin MS *et al.*, 2010; Tseng KL *et al.*, 2006). In a randomized placebo-controlled study, the group receiving *Chi-Ju-Di-Huang-Wan* medication had a significantly improved Rose-Bengal and fluorescein TBUT compared to placebo group at 2 and 4 weeks respectively (Chang Y-H *et al.*, 2005). A Korean study showed that in TBUT in an acupuncture group had improved TBUT (p not statistically significant) after 3 weeks (Lan W & Tong L, 2011; Shin MS *et al.*, 2010). Finally, in one meta-analysis of 6 randomized controlled trials, the authors found that acupuncture significantly improved TBUT (p < 0.0001), Schirmer's test (p < 0.00001) and cornea fluorescein staining (p = 0.0001) (Lee MS *et al.*, 2011).

We have recently conducted a clinical research study involving qi ju gan lu yin and qi ju gan lu yin with acupuncture on the treatment of lung and kidney yin deficiency type of dry eye (Lim P) at Singapore Chung Hwa Medical Institution.

In the study, we aimed to evaluate the efficacy of TCM herbal medicine "qi ju gan lu yin" in treating dry eye, compared to the same "qi ju gan lu yin with acupuncture" and a total of 89 age- and gender-matched subjects were recruited. This included 44 in Group 1, the TCM Herbal Medicine Group, and 45 in Group 2, the TCM Combined Methods Group. All partici-

pants had dry eyes as their main complaint and were aged 40-70 years old. All subjects had good general health, no ocular disease, non-smoking and were non-contact lens wearer. The inclusion criteria of dry eye subjects were a positive score in the SPEED Questionnaire (Standard Patient Evaluation for Eye Dryness Questionnaire). The study group (Group 1, TCM Herbal Medicine Group) of 44 patients were given qi ju gan lu yin orally and the control group (Group 2, TCM Combined Methods Group) of 45 patients were given qi ju gan lu yin combined with acupuncture twice a week. Both groups were treated for 30 days. Pre- and post-treatment measurements of Schirmer's and TBUT test were obtained for the TCM Herbal Medicine Group (Group 1) and TCM Combined Methods Group (Group 2). We used the Right eye as the main observation eye and for Schirmer's I test (mm/5 min) result in Group 1, $p = 0.04$. In Group 2, $p = 0.668$. For Tear Break-Up Time (TBUT), the values were $p = 0.001$ in Group 1 and $p = 0.099$ Group 2.

No significant differences were found in Schirmer's test readings between the two groups $Z = -1.441$ $p = 0.150$ Significant differences were obtained for the TBUT between Group 1 and Group 2 at the post treatment visit. Group 1 performed better than Group 2, where $Z = -7.013$ $p = 0.001$ for Group 1; and $Z = -1.650$, $p = 0.099$ in Group 2. The total efficacy or % in improvement in SPEED was 54.4% for Group 1 and similar in Group 2 (53.3%). The SPEED improvement in group 1 was 3.58 ± 5.40 and Group 2 was 4.40 ± 7.82 . There was no significant difference between the two groups ($t = 0.520$, $p = 0.604$). The percentage improvement in the SANDE (Schaumburg DA et al., 2007) or Visual Analogue Score (VAS) in Group 1 and 2 was 61% and 55.5% respectively. VAS (Visual Analogue Score) improvement for Group 1 was 24.01 ± 23.99 and Group 2 was 22.70 ± 24.33 . The improvement between the 2 groups was not significantly different ($t = -0.252$, $p = 0.802$).

In addition we found that the TCM lung and kidney yin deficiency score aggregates for Group 1 was 68.18% and for Group 2 was 71.11%. The TCM lung and kidney yin deficiency improvement in Group 1 was 3.76 ± 6.04 and Group 2 was 4.50 ± 5.81 . These were not significantly different between the two groups ($t = -0.205$, $p = 0.838$).

The findings demonstrate the usefulness of TCM treatment in treating the commonly seen dry eye disease in Singapore. In this study, acupuncture does not demonstrate any additional therapeutic effect over and above herbal medication alone. In fact, for TBUT, Group 1 (TCM Herbal Medicine alone) has in fact shown a better result than the combined TCM methods. The result findings suggest that TCM herbal medicine may be used as an alternative medicine to treat dry eyes in Singapore.

In addition, we performed a review of other clinical trials investigating the efficacy of TCM in the treatment of dry eye disease (Table 7).

5 Conclusions

A previous study in Singapore has evaluated the knowledge, attitude and practice of TCM practitioners in treatment of dry eye (Lan W *et al.*, 2012). This study shows that at least in institutional practice, the registered Chinese physicians were keen to participate in the treatment of dry eye. Although there has been randomized controlled studies in TCM in dry eye, the results are often controversial (Lan W & Tong L, 2011) and much larger studies are being planned and conducted (Kim TH *et al.*, 2010; Kim TH *et al.*, 2009). Use of combined modalities

Author, year	Sample size	Type of treatment	Duration of follow-up	Randomization	Control group	Outcome	Language
(Chang YH <i>et al.</i> , 2005)	80	Chi-Ju-Di-Huang-Wan	4 weeks	-	Yes	Symt,TBUT, ST, St	English
(Shi JL & Miao WH, 2012)	65	Acupuncture	3 weeks	Yes	Yes	TBUT, ST	Chinese
(Kim TH <i>et al.</i> , 2012)	150	Acupuncture	4 weeks	Yes	Yes	Symt,TBUT,ST	English
(Xu XH & Fang XL, 2012)	30	Acupuncture	2 sessions	Yes	Yes	Symt	Chinese
(Chen LQ, 2008)	70	moxibustion	-	Yes	Yes	Symt,TBUT, St	Chinese
(Qiu X <i>et al.</i> , 2011)	10 rabbits	Acupuncture	10 sessions	-	-	Tear proteins	English
(Jeon JH <i>et al.</i> , 2010)	36	Acupuncture	4 weeks	-	-	Symt,TBUT, ST	English
(Kim TH <i>et al.</i> , 2010)	150	Acupuncture	4weeks	Yes	Yes	Symt,TBUT,ST	English
(Shin MS <i>et al.</i> , 2010)	42	Acupuncture	3weeks	Yes	Yes	Symt,TBUT,ST	English
(Wei LX <i>et al.</i> , 2010)	80	Acupuncture	-	Yes	Yes	Symt,TBUT,ST	Chinese
(Gong L <i>et al.</i> , 2010)	44	Acupuncture	3 weeks	No	No	Symt	English
(Gao WP <i>et al.</i> , 2010)	56	Acupuncture	-	No	No	Symt, TBUT,St	Chinese
(Gong L & Sun X, 2007)	Rabbits	Acupuncture	-	No	No	ST	English
(Zhang Y & Yang W, 2007)	61	Acupuncture, moxibustion	-	Yes	Yes	Symt,TBUT,ST	English
(Bai H <i>et al.</i> , 2007)	57	Electroacupuncture	2 months	No	No	Symt	Chinese
(Tseng KL <i>et al.</i> , 2006)	43	Acupuncture, SSP	4 weeks	Yes	Yes	Symt,TBUT,ST	English
(Gronlund MA <i>et al.</i> , 2004)	25	Acupuncture	10 sessions	Yes	Yes	Symt,	English
(Blom M & Lundberg T, 2000)	70	Acupuncture	6 months	-	-	SFR	English
(Nepp J <i>et al.</i> , 1999)	102	Acupuncture	10 sessions	Yes	Yes	TBUT,ST	German
(Blom M <i>et al.</i> , 1999)	32	Acupuncture	1 month	No	No	SFR	English
(List T <i>et al.</i> , 1998)	21	Acupuncture	10 weeks	-	Yes	SS	English
(Nepp J <i>et al.</i> , 1998)	-	Acupuncture	-	Yes	Yes	-	English
(Blom M <i>et al.</i> , 1993)	21	Acupuncture	-	No	No	SFR	English

Table 7: Clinical trials on use of TCM in dry eye management.

of TCM may not necessarily be advantageous over a single modality, although the specific nature of the modality used may determine the outcome.

It seems that in Asian countries, the use of TCM is widespread and prevalent increasingly, health care workers have realized the holistic nature of dry eye. As TCM deals holistically with patients' conditions, many dry eye patients are willing to be treated with TCM. In any case, the coordination of care of dry eye between TCM and western practitioners may be advantageous for many patients. We eagerly await the outcome of the major trials being conducted in this area.

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