

The Liver's *Shuxie* Function

Mary Garvey and Qu Lifang

Abstract This paper discusses the liver's *shuxie* function by examining the separate or distinct actions of *shu* and *xie*. *Shu* means coursing, dredging, coming and smoothing. *Shu*-coursing is a well-known function of the liver, which keeps the channels, tissues and organs in good order so that the circulation of *qi*, blood, and fluids throughout the body is smooth and free of obstruction. *Xie* means discharge and includes external discharge as well as internal secretions. *Xie*-discharge/secretion is rarely emphasised in modern texts. *Shu* and *xie* are shown to have a mutually supportive and mutually engendering functional relationship.

Traditionally, *shuxie* benefits and enables traditional Chinese medicine (TCM) physiology generally, and has a close relationship with male and female reproductive functions. With a more detailed understanding of *shuxie* it is evident that the *xie*-discharge/secretion function is particularly important, for example, for ovulation, menstruation and lactation in women and emission in men. In this context, the discussion also highlights the liver-kidney relationship. The liver and kidney pairing forms a fundamental axis of TCM physiology, and the harmonious integration of liver *shuxie* (dredge and discharge) and kidney *fengcang* (seal and store) is an essential component of their relationship. Various examples of *shuxie* function are examined to show how TCM has adapted classical interpretations so that Chinese medicine discourse today includes aspects of neural, endocrine and immune physiology.

Key Words

Shuxie, dredging/coursing and discharge/secretion, *fengcang*, seal and store, TCM physiology, TCM liver function

Introduction

Traditional Chinese medicine (TCM) holds that the spleen governs the production of vital substances, the heart and lung govern their movement, the kidney governs their storage, and the liver is in charge of *shuxie*. Commonly called 'maintaining the patency of *qi*' or 'free coursing', *shuxie* function influences many areas of TCM physiology.

Shuxie (疏泄) means dredge and discharge, so *shu* and *xie* may be thought of as describing two distinct functions. The term first appears in *On Inquiring of the Properties of Things* written in 1347 CE by Zhu Zhenheng, also known as Master of Dan-xi. According to Zhu:

'Seal/close and store (封藏 *fengcang*) are controlled by the kidneys; dredge/course and discharge/let out (疏泄 *shuxie*) are controlled by the liver.'

In Chinese medicine, the liver performs several important physiological roles including storing blood, governing sinews, as well as *shuxie*. But coursing and discharge is fundamental to the liver's functional role, and relates to its association with the wood element of the Five Phases. Liver *shuxie* is to do with emanation and emergence,

'... issuance and distributing of blood and nutrients, effusion of the *jing qi* ... , promotion of high spirit in one's outlook on life, and the brightening of the vision owing to its *jing qi* reaching the Eyes on its way out.' (Liu & Liu: 47)

Recent publications have developed and extended traditional thinking on liver function, indicating that it has a close relationship with neural, endocrine, and immune systems. In this article the concept and physiology of the liver's *shuxie* function is explored. Analysis of Chinese medicine's classical theories concerning liver function lends support for some of the biomedical interpretations developed in recent times by TCM authors.

Modern interpretations of TCM liver function

Biomedical liver physiology is extensive, varied and complex. The liver regulates several hormones, and it metabolises those that do not reach their targets excreting the waste either through the urine or as bile. It is involved in the regulation of blood sugar levels, the storage of energy, and cholesterol metabolism. It detoxifies alcohol, drugs and poisons, and produces blood clotting factors,

blood proteins, bile, and more than a thousand different enzymes. (Nabors, 1997: 37; Van Buskirk, 1996: 30)

Reports of modern laboratory and clinical research in China have linked TCM liver function with hyperthyroidism and diabetes, and discuss the application of herbal preparations with actions known to smooth and regulate liver *qi*. Researchers have also linked liver *qi* with immunological functions, and with the secretion of various hormones and neurotransmitters. (Chen and Yang, 1995)

As part of the research conducted by Yan & Zhang, immune, digestive and endocrine functions were tested in patients with diverse diseases (such as liver cirrhosis, chronic colitis, or amenorrhoea), but with liver *qi* patterns in common. The indices for all functions had become abnormal in these patients, and cell immune function in particular had declined. Animal model experiments were then conducted to test the effect of TCM treatment for liver *qi* syndrome, and it was found that corticosterone levels increased with treatment. Their paper suggests that properly functioning liver *qi* regulates and stabilises the hypothalamus-pituitary-adrenal axis – a portion of the neuroendocrine system and the major regulator of hormonal activity and the immune mechanism. (Yan & Zhang, 1995)

The female reproductive cycle, from development in utero through to menopause, is controlled by various hormones. This involves not only the gonads and associated structures, but also most importantly, the hypothalamo-pituitary axis. (Van Buskirk, 1996) Lactation is a good example of this physiological complexity, involving mammary tissue, neuroendocrine, psycho-emotional, genetic and environmental factors. Psycho-emotional, inherited and environmental factors always inform the clinical picture in Chinese medicine. What is specific for Chinese medicine in the case of lactation is that milk is formed from *qi* and blood, and the spleen, stomach and liver channels, which traverse the breast area, have pathogenic implications. (Tureanu & Tureanu, 1994: 24)

From within their own conceptual frameworks, biomedical and TCM phys-

iological perspectives are equally cogent but perhaps difficult to reconcile. They describe the same body and yet it is not immediately evident how, for example, the mammary tissue and hypothalamo-pituitary axis might relate to the TCM liver. Rectifying liver *qi*, that ubiquitous treatment strategy, is nowadays applied to an assortment of biomedical disease categories whose relations with the TCM liver may seem tenuous. Can a more detailed examination of TCM liver physiology provide any assistance?

Shuxie – coursing and discharge

According to TCM the health of the body's vital substances depends on, and

The term and its image (dredging, combing, untangling) indicate that the liver must keep all the textures² of the *zangfu* and their tissues and organs clear and in good order. In order for the *qi* and fluid passageways of the body to be kept smooth and free of obstruction, the dredging or coursing action helps clear away turbid *qi* and wastes produced by the viscera and tissues. *Shu*-coursing therefore provides free or smooth flow, clear conditions, and an optimum environment for its counterpart, *xie*-discharge.

Meanings for *xie* include discharge, leak, release, and secrete (Wiseman & Ye: 130, 357), and in the context of liver function refer to the discharge or disper-

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is reflected in, their movement and distribution. The pathways and channels therefore must be kept smooth and free of obstruction. The free circulation of *qi* and blood relies on the textures of the *zangfu* and their related tissues and organs being kept ordered and tidy. Liver *shuxie* is largely responsible for this.

It can be seen from the term itself that the liver's *shuxie* function has a dual nature.

Synonyms and associated terms for *shu* include coursing, dredging, combing, untangling, smoothing. (Wiseman and Ye, 1998: 102) *Shu* is often given in English as free coursing or dredging to allow uninhibited, unobstructed movement. Healthy *shu* (dredging and coursing) action then refers to the liver's ability to smooth and regulate the flow of *qi* and blood, and this aspect of liver function is generally well understood by practitioners and students of TCM.

sal of the body's physiological substances.

On the one hand, 'discharge' refers to the removal of turbid *qi* from the interior to the exterior of the body. The external discharge of turbid *qi* clears and removes the waste products of catabolism: liver *shu*-coursing for the smooth circulation of *qi* and blood is clearly enhanced by this.

On the other hand, clear *qi* or pure substances are produced by the anabolic activity of the cells. The discharge of these materials from the cells of the tissues and organs is referred to as 'secretion', and with respect to TCM liver *xie*-discharge function, pertains to secretions of, for example, the biliary and pancreatic systems.

Xie-discharge/secretion enables, complements and depends on its *shu*-coursing counterpart, but modern TCM texts tend not to emphasise the term or relationship. Therefore the following will

focus on *xie* and its physiology using the liver channel pathway to guide explanations and examples.

The *Xie* Function

For liver *shuxie* function, *xie* refers to two kinds of discharge: external discharge and internal secretion. 'External discharge' can be further subdivided into external discharge of waste materials, and external discharge of other physiological materials.

With regard to the external discharge of waste materials, the *Lingshu* says that the liver channel is important for lower *jiao* physiology, and can give rise to diseases such as diarrhoea, enuresis and dysuria.

'The liver may give rise to certain diseases such as chest fullness and congestion, vomiting, hiccup, diarrhoea, inguinal hernia, enuresis, dysuria and retention of urine.'¹³ (*Lingshu* chapter 10⁴)

An example of prescriptions that belong to a type of liver *xie* disorder associated with external discharge of waste materials is *Tong Xie Yao Fang* (痛瀉要方 'Prescription for Painful Diarrhoea'). This is a famous prescription for chronic diarrhoea with abdominal pain due to liver *qi* stagnation, where the pain is relieved after passing stools. The formula is designed to soothe the liver and strengthen the spleen in order to relieve pain and regulate the stools.

Similarly, the combination of Liv 5 *ligou* with Ren 3 *zhongji* is a common point prescription for cystitis. The clearing action of the liver channel *luo* point drains damp-heat from the bladder and lower *jiao* and regulates urinary function.

The external discharge aspect of liver *shuxie* therefore includes the regulation of urination and defaecation. 'Liver *Qi* Stasis' is one of the possible pathological conditions that modern clinical texts include in their discussion of urine and stool disorders. However, the analysis of liver pathology will usually emphasise disruption of smooth flow (*shu*-coursing) as the relevant mechanism and overlook *xie*-discharge function. (Wu, 1960; Cheng, 1999; Maciocia, 1994; Maclean & Lyttleton, 1998)

Discharge of waste material is one part of the external *xie* function. Other

external discharge functions associated with liver *xie* include menstruation, lactation, and seminal emission. Biomedically these are related to endocrine functions and here, from a TCM perspective, we can link the discussion to the *xie*-internal secretions.

Xie-internal secretions include a number of digestive and endocrine functions and rely on the liver to control, regulate or influence the organs and glands included in the channel's internal and surface pathways.

The liver channel pathway is given in the *Neijing*:

'*Zu jueyin* (liver) channel, follows the *yin* side of the thigh, reaches the

leucorrhoea, pregnancy, and delivery.

'The Liver is of paramount importance in women's physiology and menstruation, mostly through its relationship with the Uterus [via the channel pathway] and Blood [liver stores the blood]. ... The Liver also has a significant influence on menstruation through *Qi*. Liver-*Qi* has the very important function of moving Blood via *Qi*.' (Maciocia, 1998: 12-13)

Disruption of liver *shuxie* therefore can result in dysfunction affecting ovulation and/or related hormonal factors and causing advanced or delayed menses, flooding, or spotting. When liver *shuxie* function is normal, the woman is fertile,

TCM regards the liver as 'the congenital root of women'

pubic hair, encircles the sexual and reproductive organs, arrives at the lower abdomen, holds the stomach, links with the liver and connects with the gall bladder. The channel goes up through the diaphragm, and distributes over the ribs, hypochondrium and armpit areas. It then travels along the back of the throat, enters the pharynx, connects with the ocular system, ascends to the forehead and converges with the *du* channel at the vertex (*Baihui* – Du20).⁵ (*Lingshu*, chapter 10)

So, we can see that the liver is important for lower *jiao* physiology from its channel pathway: the pathway includes the lower abdominal region, and the *Neijing* specifically mentions the sexual and reproductive organs and glands.

The kidney and liver are both closely related to the reproductive organs and their physiology, and TCM regards the liver as 'the congenital root of women'. (Pan & Zhu, 1964: 465) In women, liver *shuxie* plays an important role in the physiology of ovulation, menstruation,

and menses come on time.

According to Chinese medicine the gall bladder is physically and energetically connected to the liver. In the upper abdominal region, the stomach, liver and gall bladder are specifically mentioned and linked in the *Neijing*'s description of the liver channel pathway. TCM holds that surplus *qi* from the liver transforms to produce bile and is channelled into the gall bladder for discharge into the body. The liver *shuxie* function governs its secretion and discharge. (Wiseman & Ellis, 1996: 65-6)

Bile is partially a digestive secretion. When liver *shuxie* fails this can disrupt bile secretion and result in symptoms such as intolerance for fatty, oily foods, bitter taste in the mouth, distending pain in the hypochondrium. Bile is also in part an excretory product containing waste from the breakdown of red blood cells. Disturbance of this (*xie*-discharge) function results in jaundice.

The channel travels through the abdominal region and passes close to, or

'holds', the stomach. Glands of the pancreas, which belong to spleen and stomach function in TCM, are located here also. Gastro-intestinal tract disorders (and particularly those with an emotional component) are thereby energetically related to the liver functional system by its channel and connections regulating *shuxie* function.

Researchers investigating the relationship between TCM liver function

and agalactica.

Liu *et al* conducted a clinical trial on hyperprolactinaemia (HP), the most common form of pituitary hyperfunction. In men the elevated prolactin levels lower libido and often produce impotence. The condition is more common in women and the key diagnostic features include anovulatory menstruation, oligomenorrhoea or amenorrhoea with or without galactorrhoea. (1995: 109)

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and diabetes note that eye problems are a common complication, and cite the importance of emotional distress in the development of diabetes. Experiments have demonstrated that emotional disorders can influence blood sugar concentrations in diabetes patients due to the relationship with the hypothalamus. Treatment focused on regulating or restoring TCM liver function is reported to benefit some patients where the usual methods produce no results. (Zuo & Zhang, 1994; Zheng & Song, 1994)

After passing through the diaphragm, the channel's pathway distributes over the ribs and hypochondrium to the armpit. This part of the channel includes the breasts and mammary glands. TCM holds that the breast belongs to stomach and the nipple belongs to liver, and here we have another example of the liver's external *xie*-discharge. 'Since milk production shares a common source with the menses, its normal secretion is also influenced by the Liver function.' (Liu *et al*, 1995:116) Liver dysfunction is a prevailing pattern in disorders such as mastitis

HP is 'chiefly found in overweight people with stagnant liver *qi*' and causal factors often include emotional depression, sudden anger, excessive grief, thinking and anxiety, and retention of phlegm. (Liu *et al*: 116) In their clinical trial, one treatment group received acupuncture for liver *qi* stasis and/or phlegm-dampness. Post-treatment and long-term follow-up tests for the acupuncture group showed that prolactin, follicle-stimulating hormone, luteinizing hormone, progesterone and estradiol levels returned to normal or near-normal levels in the majority of subjects.

According to Liu *et al*,

'[Acupuncture appears] to function at the level of the hypothalamus, leading to a drop in [prolactin], and ... an additional, possibly direct influence on the ovary is suggested by the greater increase of estrogen in the acupuncture group.' 1995:119

Several of the *yin* channels, including the liver, pass through the throat area. 'The thyroid gland governs how

fats are burned by the body ... [and] goiter is ... a sign of a congested liver.' (Nabors, 1997: 38) TCM's explanation of goiter, or enlargement of the thyroid gland, is that there is a local accumulation or congealing of phlegm, damp, and possibly blood, and this situation is usually sustained and/or preceded by Liver *Qi* Stasis. Clinically, obstruction of liver *qi* is the predominant or accompanying pattern in most cases of goiter. TCM treatment for thyroid disorders therefore includes rectifying liver *qi* and transforming phlegm. (Zhong & Tang, 1994)

The channel ascends to connect with the eyes. Tears are one of the five types of transformed fluids.⁶ They moisten nourish and protect the eyes, belong to the liver, and are another example of external *xie*-discharge. Excess or insufficient lacrimation suggests morbid changes associated with the liver.

The liver channel is the only *yin* channel to travel to the top of the head. On its way to the vertex and Du 20 it seems likely that its pathway passes near or includes the hypothalamus and pituitary gland. Between them, these two structures govern many fundamental aspects of our neurophysiology, immunology, and endocrine functions.

The hormones released by the pituitary for example, have wide-ranging influences on the body. They affect development (human growth hormone), milk secretion (prolactin), sexual and reproductive activities (luteinizing hormone), and some target other endocrine glands regulating for example the thyroid, ovaries and testes. Functions pertaining to these processes and glands from a TCM perspective are reliant on liver *shuxie* and kidney *fengcang*.

With respect to the liver's lesser-known *xie*-discharge/secretion function, the channel pathway includes specific physiological areas associated with waste and other excretions, and with gland or organ secretions. Examining modern clinical approaches in the light of traditional physiology in this case helps to demonstrate the particular relationship between the discharge-secretions (or at least their functional consequences) and liver *shuxie* – coursing and discharge.

Conclusion

Inherited and acquired essences stored (*fengcang*) in the kidney rely on liver *shuxie* for their distribution and for the unobstructed circulation of *qi* and blood generally. Moreover, the liver's *shuxie* and kidney's *fengcang* are a mutually supporting functional system and in modern physiological terms, their relationship affects complex neural, endocrine, and immune responses. From the point of view of the modern practitioner, this helps to explain why TCM

places such importance on the liver-kidney physiological axis.

'The liver governs *shuxie*' (肝主疏泄 *gan zhu shu xie*) is commonly explained as the liver ensuring the smoothness and regularity of *qi* flow. Ensuring smooth flow of *qi* in turn assists in maintaining clear, unobstructed flow through the channels and collaterals, the harmony of *qi* and blood, and normal *zangfu* function.

But this is not the full meaning of *shuxie*. More than 'ensuring the smooth

flow of *qi*', *shuxie* refers to two interdependent functions: *shu*- coursing, dredging, combing and smoothing; combined with, *xie*- external discharge and internal secretion. According to the analogical thinking which is so characteristic of Chinese medical theorising, healthy functioning of liver *shuxie* is the physiological representation of the qualities of emanation and emergence we associate with the wood transformative phase.

Footnotes

1. 格致余論, *Ge Zhi Yu Lun*.
2. For a discussion of *couli* (膜理 spaces and textures) see Qu and Garvey, 2001.

3. 是主肝所生病者，胸滿嘔逆飧泄，狐疝遺溺閉癰

Shi zhu gan suo sheng bing zhe, xiong man ou ni sun xie, hu shan yi niao bi long.

Sun xie is a term meaning lienteric diarrhoea. This particular diarrhoea is caused by depression of liver *qi* and hypofunction of the spleen giving watery stool with undigested food, borborygmus, and abdominal pain.

Bi long or *long bi*: the term means dysuria, or urinary retention, (obstructed urine)

4. Quotations from Chinese medicine's classical literature are not attributed to a particular translator or English-language publication because, where possible, a variety of Chinese and translated sources have been consulted. By not using any single or 'authoritative' edition, the authors intend to avoid the inference that there is consensus as to interpretation, and advise that quotations given here are derived from Chinese sources in the first instance: see, for example, Shang & Zhai.

5. 循股陰入毛中，過陰器，抵少腹，挾胃屬肝絡膽貫膈，布脅肋，循喉嚨之後，上入頰頰，連目系出額，與督脈會于顛

Xun gu yin ru mao zhong, guo yin qi, di shao fu, jia wei shu gan luo dan, shang guan ge, bu xie lei, xun hou long zhi hou, shang ru hang sang, lian mu xi, shang chu e, yu du mai hui yu dian.

6. 五臟化液 ... 肝爲淚

Wu zang hua ye ... gan wei lei (Neijing Suwen, chapter 23)

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For any correspondence please contact:

Mary Garvey
College of Traditional Chinese Medicine
University of Technology, Sydney
PO Box 123
Broadway, NSW 2007, Australia