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Title

Was acupuncture developed by Han Dynasty Chinese anatomists?

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Running title

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ABSTRACT

Anatomical dissection has begun to reveal striking similarities between gross anatomical structures and the system of nomenclature used in traditional Chinese acupuncture. This paper argues that acupuncture point nomenclature is rooted in systematic anatomical investigation of cadaveric specimens, and that acupuncture points and meridians are purposefully named to reflect observable physical form.

Two types of evidence are compared: observations of physical structures based on anatomical dissection, and translation and analysis of original Chinese texts. Evidence is contextualised through in-depth practical understanding of acupuncture. Points designated as 天 *tian* (heavenly/superior), 下 *xia* (below/inferior), 髎 *liao* (bone-hole), 飛 *fei* (flying), 委 *wei* (bend) and 谿 *xi* (mountain stream/ravine) are investigated. These acupuncture point names: (a) specify position; (b) reflect function and/or form; (c) indicate homologous structures; (d) mark unusual structures; and/or (e) describe the physical appearance of a deep (dissected) structure by likening it to a homologous everyday object. Results raise intriguing possibilities for developing an understanding of acupuncture points and meridians firmly based in the material and functional anatomy of the human body. Such an understanding has the potential to open new fields of thought about functional anatomy. It also has implications for future investigations into the mechanisms of acupuncture, and gives some insights into the possible origins of this iconic area of Chinese medicine.

Keywords

Acupuncture, gross anatomy, Chinese medicine, history of anatomy, anatomical nomenclature, acupuncture point nomenclature

TEXT

Introduction

Acupuncture is a branch of Traditional Chinese Medicine in which fine needles are inserted into specific locations in the body known collectively as acupuncture points. Points are arranged along meridians, pathways along which vital energy is said to flow. Acupuncture has formed a key part of the medical system in Asia for over 2,000 years, where it is currently offered in hospitals as an optional part of mainstream medicine. Within the UK health service there are two National Institute for Health and Care Excellence (NICE) recommendations for the use of acupuncture to treat chronic lower back pain (National Collaborating Centre for Primary Care, 2009) and migraine headaches (NICE, 2012). These recommendations are based on systematic Cochrane reviews (Furlan et al., 2005; Linde et al., 2006). Acupuncture and its therapeutic potential therefore warrant further attention.

The mechanisms by which acupuncture exerts its effects remain unknown. Physiological investigations focus on the electrical properties of particular acupuncture points using both direct recording in animal models (G. J. Wang, Ayati, & Zhang, 2010)(Z. J. Zhang, Wang, & McAlonan, 2012) and fMRI in humans (Napadow et al., 2007)(Z.-Q. Zhao, 2008)(L. Zhao et al., 2014). Others investigate vasodilation (X. Zhang, Wu, Nie, Jia, & Yu, 2014), fluid dynamics (W.-B. Zhang, Zhao, & Kjell, 2013), fascia (Langevin & Yandow, 2002), epigenetics (J.-Y. Wang et al., 2015), adenosine production (Goldman, Chandler-Militello, Langevin, Nedergaard, & Takano, 2013), and more. Social scientists investigate acupuncture using other (non-biomedical) explanatory models, including focusing on phenomenological experience, the ritual performance of healing, patient-healer relationship, and ecological imbalances (Fukuda, Shinbara, Yoshimoto, Yano, & Kuriyama, 2005; Hsu, 2012; Kaptchuk, 2000; Unschuld, 1985).

The historical origins of acupuncture techniques also continue to be debated (Kaptchuk 2002); however, it is generally accepted that acupuncture was developed during the Han Dynasty (206BC-221AD). The *Mawangdui* medical texts were found in a tomb which was closed in 168BC. They describe anatomical features of the body, 11 meridians, treatment using bloodletting and cauterisation, but no acupuncture points or needling (Harper, 1998). These texts were followed by the *Yellow Emperor's Classic of Internal Medicine* (黄帝内經) (Wu & Wu, 1997) which describes 12 meridians, needling technique and specific acupuncture points. This seminal text was developed and written by many authors over a 400-year period during the Han Dynasty (206BC-220AD). It refers directly to the *Mawangdui* corpus (Keegan, 1988), indicating an evolution of ideas between the *Mawangdui* text and the *Yellow Emperor's Classic of Internal Medicine*.

The research presented in this paper contributes to both the debate about the mechanisms of acupuncture, and the debate about its origins. It begins with a brief overview of anatomical investigation and acupuncture naming conventions in China, and the historical and cultural contexts in which these developed. Data are then sourced from two intersecting fields of

investigation: anatomical dissection, and translation and analysis of original Chinese acupuncture texts. Comparative analysis of results suggests that acupuncture points are distinguished neither by their physiological properties nor their cosmological qualities. Instead, points appear to be named according to gross anatomical characteristics. In this case, Han Dynasty texts describing meridians and acupuncture points would have been developed and written by anatomists with a highly-developed and detailed understanding of the observable, physical properties of the human body. Results suggest that an improved understanding of acupuncture may come from functional anatomical research, combined with close linguistic, cultural and historical examination of the original nomenclature used to describe acupuncture points, and attention to how this nomenclature has been transmitted and has changed over time. Some implications of this hypothesis are discussed.

History of human dissection in China

Human dissection has a long history in China. The first recorded dissection details the fate of the criminal Wang-sun Qing and is found in the Book of Han, a chronological history of the Han Dynasty from 206BC to 23AD:

> "The Imperial physician, master herbalist and a skilful butcher together disemboweled and flayed him, measured his five organs, and with fine bamboo poles, the length of his blood vessels, to know where they begin and end, so that a person can use this [knowledge] to heal illness" (Ban, Ban, & Ban, 111AD)

The Han Dynasty in which such dissections were taking place ended in war in 221AD. There are no further known records of dissection until nearly 1,000 years later.

There was a well-documented resurgence of anatomical study in China during the Song Dynasty (960-1279AD). Many criminals were executed and dissected as part of their punishment. These investigations formed the basis for *The Anatomical Atlas of Truth* (存真圖) (Yang, 1106), which contains detailed images of the internal anatomy of the torso and drawings of all 12 meridians with the series of five cardinal phase points marked. At this time the bronze man acupuncture-point models (W. Wang, 1026) were also made. These bronze acupuncture models are hollow life-sized teaching models with small holes for the acupuncture points. They were used for examination purposes. The bronze body would be filled with water and the holes obscured with wax; the student would then have to accurately find the point by inserting a needle which, if positioned correctly, would pierce the wax so that water would flow. From this time onwards, the location of acupuncture points was, quite literally, cast in bronze. In 1247, the first known book on forensics was written (Sung, 1247). It is unclear what happened after this. By 1835AD, when the first American missionary doctors arrived in China, dissection was not used in Chinese medicine (Cowdry, 1921). It was reintroduced at this time, from the West, by American doctors (Xu, 2012).

The historical development and transmission of anatomical knowledge in China was not widespread or consistent. There was a general taboo surrounding dissection: mutilation of the body was forbidden under Confucian law (which underpinned the Han Dynasty and which

continues to have significance in China today) and dissection was a punishment reserved for criminals. The transmission of ancient knowledge was also affected by the simplification of traditional Chinese script during the Cultural Revolution (1966-1976). At this time, the ability to read Classical Chinese became a specialised skill and the study of the original texts – once considered a basic requirement for any trainee doctor – was no longer widely accessible.

Acupuncture naming conventions

In Chinese medical practice, as described in the *Yellow Emperor's Classic of Internal Medicine*, knowledge of the material structure of the body is interpreted and contextualised through the holistic lens of Five Element or Five Phase (五行) theory. This theory is used to explain both human physiology and the natural order of the world; it underpinned the Chinese world view of both nature and the state at the time of the development of acupuncture (G. Lloyd & Sivin, 2002; Unschuld, 1985), and has endured as a medical paradigm throughout the intervening 2,000 years. The organisation of the state is used as an analogy for the organisation of the body in Five Element theory. The heart is the Emperor, the liver is the General, the lung is the Prime Minister, the spleen/pancreas are the Granaries, the kidneys are the Minister of Health, and the pericardium is a Civil Servant (Geoffrey Lloyd & Sivin, 2002). According to the Five Element paradigm the body is in a state of dynamic homoeostasis governed by regular physiological patterns which cycle through the elements of fire, earth, metal, water and wood. When the passage through these cycles is smooth and harmonious, then the person will be healthy. Disease occurs when the normal patterns of change become disrupted. The function of medicine, and in particular acupuncture, is to restore normal homoeostatic boundaries.

Acupuncture is one of nine modalities of Chinese medicine within this paradigm; others include Chinese herbal medicine and *Qi gong* exercise. Acupuncture points are specific locations in the body where a fine needle is inserted in order to effect change. *The Yellow Emperor's Classic of Internal Medicine*, in which acupuncture points are first described, is organised into two sections: *Simple Questions* (素問) and *The Spiritual Pivot* (靈樞). The first part is primarily concerned with physiology, and elucidation of how the five phase theory applies to the human body. The second part contains texts that were written later; it includes most of the anatomical texts, and is the main focus of the present paper. The location of the meridian pathways and the positioning of the major acupuncture points that were originally described in these texts remains the same today, although the numbers and names that describe these points today are a result of deliberate simplification and systematisation.

As acupuncture moved from China to the West in the 19th and 20th centuries, each point became designated by a numbering system according to the meridian on which it is located. The Chinese numbering system classifies the body according to six longitudinal whole-body slices which travel from the midline laterally, three anterior and three posterior. These are then further divided into the upper (hand) and lower (foot) parts, to give a total of 12 meridians; as a result of this pairing, some point names are homologous upper and lower

body points. Each of the 12 named meridians along which acupuncture points are positioned is designated as belonging to one of these divisions.

The point naming system used by non-Chinese speaking acupuncturists is based around these twelve Primary Meridians: Lung (LU), Large Intestine (LI), Stomach (ST), Spleen (SP), Heart (HT), Small Intestine (SI), Bladder (BL), Kidney (KI), Pericardium (PC), Triple Energizer (TE), Gallbladder (GB) and Liver (LR). Different amounts of points are located on each meridian. For example, there are 45 points found on the Stomach meridian: ST1, ST2, ST3, and so on to ST45, while the Large Intestine meridian (LI) has 20 points: LI1, LI2, LI3, and so on to LI20. These two meridians together form the division known as *yang ming* or 'Shining Yang'. It is rare for acupuncturists (especially those who are trained in the West) to know the translated point names in simplified Chinese, and rarer still for them to be able to read the names in classical Chinese. The processes of translation – from Classical to simplified Chinese to English, or from names to numbers – may have served to obscure the correlations highlighted in this paper.

The corpus of Chinese medical literature is vast, reflecting two millennia of sustained medical investigation and transmission of this knowledge in varied oral and written formats. Correspondingly, many individual acupuncture points have more than one name. The World Health Organisation (WHO) has recently systematised the naming of points (World Health Organisation, 1993) and locations (World Health Organisation, 2008) and now usually only one name will appear alongside the point number in an acupuncture point manual (Lim, 2010). It is unclear why or how one point name and translation was prioritised over others in this process. A much wider selection of names exists, as there is some variation in point naming between different Chinese sources over time. The present paper considers all of these names (rather than only the WHO standardised names) as they appear in *Grasping the Wind* (Ellis, Wiseman, & Boss, 1989), an authoritative textbook on acupuncture point naming.

The aims of this paper are to (a) identify acupuncture points which share similar characters in their original Chinese names, (b) anatomically dissect these acupuncture points to elucidate whether these points also share common anatomical features, and (c) consider whether acupuncture point names (in ancient Chinese) might be anatomical designators. Findings have implications both for understanding the origins and mechanisms of acupuncture, as well as for contemporary functional anatomy. If acupuncture point names are deep anatomical designators, this would suggest that anatomical research was carried out in the Han Dynasty, at which time the point names were used to convey information about the gross anatomy of the body and interactions between different parts. If acupuncture is founded in gross anatomical investigation, then it provides a different frame through which to interpret the function of the body system.

Materials and methods

This investigation involves two different strands of research:

1. Translation and textual analysis of Classical Chinese acupuncture point names;
2. Gross anatomical dissection of the human body.

Research was carried out by VS (Diploma of Acupuncture (DipAc) and Member of the British Acupuncture Council (MBAcC)), a certified and practicing acupuncturist with over 20 years of clinical experience.

Translation and textual analysis

Point numbers and Chinese point names are listed in *Grasping the Wind* (Ellis et al., 1989), which contains both the WHO standard acupuncture point names (World Health Organisation, 1993) and also any alternative names recorded for each point. Translations of non-standard point names into English are done by VS using a variety of point location resources (Deadman, Al-Khafaji, & Baker, 1998; Ellis et al., 1989; Lade, 2005; Yan, 2003) (Yin Yang House, 2015), and classical Chinese dictionaries (Kroll, 2014; Wieger, 1965; YellowBridge, 2013) for reference.

Chinese words are often composed of two or more characters which are combined together to form a noun phrase. The meaning of the phrase is often more than the sum of its parts, and each part will contribute to the meaning of the whole. For example, 水 *shui* means water, and words or noun phrases which contain this character will have something to do with water. Five characters are examined in detail in this paper: 天 *tian* (heaven/upper), 下 *xia* (below), 髎 *liao* (bone-hole), 飛 *fei* (flying) and 谿 *xi* (ravine or mountain stream). Each of these characters occurs in the name of more than one acupuncture point, alongside other characters.

Anatomical dissection

Acupuncture point location was established on the surface of the body. This typically requires observation, palpation and proportional measurements. The proportional measurement used as standard in acupuncture is 寸 *cun* (the width of a patient's thumb at the knuckle) (World Health Organisation, 2008). It may also involve movement of a limb to make depressions or spaces between structures apparent. The position was then dissected to reveal underlying anatomical structures at, near or underlying the site of needle insertion. Anatomical features at the acupuncture point site were derived from gross anatomical dissection carried out by VS in the Anatomy Suite of the Department of Physiology, Anatomy and Genetics at the University of Oxford.

Six human cadavers (n=6; three male, three female, average age 82 years), embalmed by standard procedures (Vickers Leeds formalin embalming fluid), were dissected to expose the anatomy underlying acupuncture points. This required careful removal of at least skin and subcutaneous fat. Six cadavers were used to ensure that the findings were consistent and to highlight any inter-individual variation. All cadavers were donated for anatomical teaching and research under the Human Tissue Act (2004). Only gross anatomical information that is clearly visible when the area has been dissected by hand is included; structures requiring microscopic or technological enhancement are not reported.

Results

Acupuncture point tables for 天 *tian* (heavenly/superior), 下 *xia* (below/inferior), 髎 *liao* (bone-hole), 飛 *fei* (flying) and 委 *wei* (bend), and 谿 *xi* (mountain stream/ravine) are given as Tables 1 to 5 respectively. These tables include the following details for all 60 acupuncture points investigated: standardised point numbers and names, alternative Chinese point names and their English translations and acupuncture point location. They also include descriptions of anatomical features at each point investigated, and highlight possible links between these anatomical structures and the Chinese point names.

天 *Tian (heavenly/superior)*

Tian occurs as a character in the names of 20 different points; it is the most commonly-used character in acupuncture points. All 20 point names and their anatomical positions are given in Table 1. The word *tian* in normal speech means 'heavenly/sky/day'; *Grasping the Wind* translates the same character as 'celestial'. All 20 points were dissected in each of the six cadavers (n=120). All 20 points were located in the upper part of the body in all cadavers (n=120; 100%). It is commonly accepted that *tian* refers to this anatomical region.

The most inferior of the tian points is 天樞 *tian shu* (Heaven Pivot, ST25). This was positioned either side of the umbilicus (n=6; 100%). This point's designation of 'pivot', along with its position both in the centre of the body, and as the lowest of the *tian* points, suggests that the umbilicus is the pivot point which is situated between upper and lower parts of the body.

天 *tian* does not have an obvious modern anatomical term which is similarly used as an absolute, rather than a relative term. The closest modern equivalent may be 'upper', as in upper limb.

下 *xia (below/inferior)*

There are 13 different points which start with *xia*, meaning below. All 13 point names and their anatomical positions are given in Table 2. All points were dissected in each of the six cadavers (n=78). Of these, ten points (83%) were clearly located inferior to the waist (n=60; 100%).

The three points which did not lie clearly above the waist are 下關 *xia guan* (Lower Pass, ST7), 下都 *xia dou* (Middle Water Margin, TE3) and 下廉 *xia lian* (Inferior Edge, LI8). Lower Pass (ST7) was found inferior to the zygoma, anterior to the condyle of the mandible (n=6; 100%); an alternative name for it is Lower Joint. The name indicates the location of the lower jaw and this point is used clinically for problems relating to mastication. Middle Water Margin (TE3) was found on the dorsum of the hand just proximal to the fourth knuckle; it hangs below the waist when standing in the standard anatomical position (n=6; 100%). It is also, with the exception of the fingers, the most distal acupuncture point on the upper limb. An alternative point name that exists for it is Lower Metropolis or Lower City. Inferior Edge (LI8) is located on the posterolateral aspect of the forearm, distal to the cubital crease. An alternative name for it is Lower Ridge; this name also appears as an alternative name for the

point Lower Great Void (ST39). These points are in homologous positions on the arm and leg in the upper and lower sections of the same *yang ming* division.

下 *xia* does not have an obvious modern anatomical term which is similarly used as an absolute, rather than a relative term. The closest modern equivalent may be 'lower', as in lower limb.

Also of note here is the Chinese noun phrase 天下 *tian xia*, a combination of *tian* (broadly designating 'upper') and *xia* (broadly designating 'lower'). Taken as a single noun phrase, *tianxia* means 'the whole world/land under heaven/the whole of China'. This term designates 'the whole [anatomical] body', but at the same time reflects Five Phase theory which draws analogies between human physiology and the larger world ecology.

髎 *Liao (bone-hole)*

There are 19 points which have *liao*, or 'bone-hole', as the second part of their name. All points were dissected in each of the six cadavers (n=114); their names, locations and the anatomical features at each location are given in Table 3.

In total, 12 of the 19 points (63%) were positioned directly at gaps, holes or spaces in bone (n=72; 100%). Of these, four indicate the four sacral foramina: 上髎 *shang liao* (Upper Foramen, BL31), 次髎 *ci liao* (Second Foramen, BL32), 中髎 *zhong liao* (Middle Foramen, BL33) and 下髎 *xia liao* (Lower Foramen, BL34) (n=24; 100%). Eight are in bony depressions in the face, such as in the infratemporal fossa and around the ridges of the orbit. For example, 顴髎 *quan liao* (Zygoma Foramen, SI18) was immediately inferior to the zygomatic arch in the infratemporal fossa (n=6; 100%), 耳和髎 *er he kou liao* (Ear Harmony Foramen, TE22) was lateral to Zygoma Foramen, anterior to the superior border of the tragus (n=6; 100%), and 瞳子髎 *tong zi liao* (Pupil Foramen, GB1) was lateral to the orbital ridge of the eye (n=6; 100%).

The remaining seven of the 19 points which contain *liao* (37%) are found in depressions in the muscle. Three of these appear when a limb is either passively or actively moved (n=42; 100%). For example, 肩髎 *jian liao* (Shoulder Foramen, TE14) was positioned on the shoulder girdle where a depression forms in the joint crease between the humerus and scapula when the arm is fully abducted (n=6; 100%). The remaining four are found in depressions in the flesh, for example 章門 *zhang men* (Screen Door, LR13) was found inferior to the free extremity of the 11th rib where, on palpation, the finger slides off the tip of the bone onto the flesh. Another name for this point is Lard Depression; this is a fatty area when dissected (n=6; 100%).

髎 *liao* in Chinese medicine appears to describe structures for which modern anatomical terms are 'foramen', 'fossa' and 'depression'.

飛 *fei* (flying) and 委 *wei* (bend)

The character 飛 *fei*, 'to fly', occurs in the name of only two acupuncture points, 飛陽 *fei yang* (Flying Yang; an alternative name for To Fly Lifting, BL58) and 飛虎 *fei hu* (Flying Tiger; an alternative name for Limbs Ditch, TE6) (Figure 1). Both points were dissected in each of the six cadavers (n=12); Table 4a summarises the results of this dissection and compares it to the point names and translations. Both points were located at similar positions on the surface of the limb; Flying Yang on the calf and Flying Tiger on the dorsal forearm. This homologous naming and positioning draws attention to the similarities between the two points. Deep dissection at both points revealed nerves: Flying Tiger was superficial to the posterior interosseous nerve (n=6; 100%), and Flying Yang was superficial to the lateral cutaneous sural nerve (n=6; 100%). The lateral cutaneous sural nerve ran parallel to the medial cutaneous sural nerve and small saphenous vein, finishing at the lateral border of the popliteal fossa where it joined with the fibular nerve (n=6; 100%). Although it is omitted in some standard anatomical atlases (Clemente, 2009; Drake, Vogl, & Mitchell, 2010), our findings here are consistent with other studies (Ricci, Moro, & Antonelli Incalzi, 2010).

In both upper and lower limb cases, the shared nomenclature draws attention to the anatomy of two nerves which have branched away from the neurovascular bundle, i.e. 'flying' away from a main trunk. This is a characteristic that can only be ascertained through dissection. It is also only a characteristic that is evident when taking the historical and non-standardised acupuncture point names into account.

Comparing Flying Yang with a point that shares part of its name, 委陽 *wei yang* (Crooked Yang or Bend Yang, BL39), supports the above association (Table 4b summarises the point names and anatomical positions of these points). There are two acupuncture points in the popliteal fossa: 委中 *wei zhong* (Crooked Middle, BL40) is in the centre of the fossa (n=6; 100%), and 委陽 *wei yang* Bend Yang (BL39) which is on the lateral border of the popliteal fossa, lying superficial to the area where the lateral cutaneous sural nerve joins the main body of the fibular nerve (n=6; 100%). Flying Yang and Bend Yang are both anomalous points for similar reasons: the main trunk of the meridian and the points on it pass directly along the midline of the leg, except for at Flying Yang and Bend Yang, which each meridian branches off laterally. Flying Yang appears to mark the point of departure of the lateral cutaneous sural nerve, and Bend Yang marks the nerve's end-point in the lateral popliteal fossa (Figure 2).

飛 *Fei* may indicate an anatomical characteristic found in the location of the points it designates in both the upper and lower limb: a structure which branches away from the main neurovascular bundle and 'flies' alone through the tissue. There is no modern anatomical term for this, although the naming of the *vagus* nerve (Latin for 'wandering') has some similarity.

委 *Wei*, in the context that it is used in these points, may indicate the bending of the joint.

谿 *xi* (mountain stream/ravine)

谿 *xi* translates into English as 'ravine/creek/valley/gorge/mountain stream', and appears in nine acupuncture point names (n=54). All nine point names and their anatomical positions are given in Table 5. All points designated by *xi* share a common characteristic of a pulsating blood vessel which is briefly close to the surface of the body before it runs deep into a cleft between high-sided structures (n=54; 100%). This implies a visual metaphor between anatomical structures and ecological ones.

From an anatomical perspective, the most visually-striking example of this anatomical/ecological analogy is at 谿穴/谷 *xi xue/gu* (Ravine Hole/Valley; an alternative name for Return Arrival, ST29). This point is located on the lower abdomen where the inferior epigastric vessels branch from the external iliac vessels onto the posterior surface of rectus abdominis on the abdominal wall (n=6; 100%) (Figure 3). The standardised WHO name for this point is 歸来 *gui lai* (Return Arrival, ST29). *Grasping the Wind* explains that this translation is applied because the point designates a 'branch of the stomach channel that diverges from the main channel at ST12, passes downward through the stomach, and then rejoins the main channel at ST30, the point where the divergent channel returns' (pg. 83). ST12 is located in the supraclavicular fossa in the area where the internal thoracic vessels branch from the subclavian to pass along the anterior thoracic wall (n=6; 100%). ST30 is immediately inferior to ST29 and is the pulse point in the groin over the external iliac vessels (Shaw, 2014). It is possible that the 'channels' described in the *Grasping the Wind* text are actually anatomical structures: the internal thoracic (mammary), superior epigastric and inferior epigastric vessels on the anterior wall of the torso which anastomose to form a continuous vascular structure between the clavicle and the groin.

Two *xi* points, 解谿 *jie xi* (Divided Ravine; an alternative name for Separation Stream, ST41) and 陽谿 *yang xi* (Yang Ravine; an alternative name for Yang Brook, LI5) are in homologous *yang ming* locations (Figures 4 and 5), being respectively found on the dorsum of the ankle between the tendons of extensor hallucis longus and extensor digitorum longus (n=6; 100%), and on the wrist in the anatomical snuffbox (n=6; 100%). The vessels deep to these points are the dorsalis pedis and radial arteries (respectively); they pass from the leg and the forearm, around the ankle and the wrist, and onto the dorsal surface. They then dive into the first intermetatarsal/intermetacarpal space to form an anastomosis with the lateral plantar artery and the deep palmar arch respectively.

谿 *Xi* may be a metaphor for a vascular structure whose surroundings resemble a mountainous landscape with a fast flowing stream passing through it. There is no modern anatomical term for this, and although they are superficial to arterial vessels is seems unlikely that they are pulse points detected by palpation alone, as these are normally designated by 冲 *chong* (surging/gushing) (Vivien Shaw, 2014).

Discussion

The preliminary results presented here indicate that specific acupuncture point names clearly correlate with specific anatomical features. This correlation supports the hypothesis that acupuncture is based on anatomical investigation of the material qualities of the human body. Acupuncture point names investigated so far appear to: specify anatomical position (*tian* broadly designates 'superior' and *xia* designates 'inferior'); reflect function and/or form (*liao* designates 'foramen', 'fossa' or depression); indicate homologous structures and mark unusual structures (*fei* indicates a sole nerve flying away from a main bundle); and/or describe the physical appearance of a deep structure by likening it to a homologous everyday object (*xi* describes a vascular structure in a cleft). Correlations between acupuncture point names (both standardised and alternative names which exist for each point) and the anatomical features at each of the 60 points studied here are elaborated in the final column of Tables 1-5.

Results offer a new paradigm through which to interrogate the mechanisms by which acupuncture exerts its effects. Some results call attention to specific collections of structures; *fei* and *xi*, for example, have specific designations and so appear to be important in acupuncture, but have attracted less attention elsewhere. Likewise, and as elaborated elsewhere, the acupuncture term 絲 *si* (silk) calls for greater attention to be paid to fascia, which has only recently started attracting attention in the biomedical sciences (V Shaw & Aland, 2014). In this case, the unifying theory of acupuncture is neither one particular physiological system nor cosmological worldview, but instead the material, dissectible human body.

Results also offer new insights into a novel explanation for the historical development of acupuncture. Taken in conjunction with previous work, which argues that the points and meridian sharing the character 沖/衝 *chong* (surging/gushing) form a description of the extent of the vascular system (Shaw, 2014), a pattern is beginning to emerge of a medical culture focussed on the importance of blood- both its physical anatomical properties as it courses through the body, and its metaphysical properties as the carrier of the life force (*Qi*[1]) which travels with it. This is exemplified in the importance of pulse taking which forms the cornerstone of diagnosis in Chinese medicine (Hsu, 2005; Keiji, 1991; Kuriyama, 2002; S.-H. Wang, 1997).

This research highlights similarities between two sophisticated medical philosophies which are commonly considered to be opposed to each other. This is not to say that acupuncture is biomedical or objective (bearing in mind that objectivity itself is the product of a socially-constructed style of knowing (Hsu, 2012)). But nor is it devoid of in-depth understandings of internal material form and function of the human body derived from systematic anatomical investigations (Schnorrenberger, 2008).

[1] The character for *Qi* 氣 is made up of characters for 'air' and 'rice'. It has no direct single translation and the exact meaning changes with context. It usually denotes some kind of invisible life force and has been variously translated as breath/energy/physiological responses whose mechanism is not visible to the naked eye.

Where the two medical systems do diverge is in the sociocultural contexts in which anatomical investigations were carried out, and the worldviews through which anatomical knowledge was interpreted and incorporated into healing practice. For example, common anatomical naming conventions are to group structures together according to function (for example, the flexors of the forearm) or to name structures located physically near each other similarly (for example, blood vessels and nerves near the tibia are named anterior tibial artery and posterior tibial artery). This reflects the broader biomedical philosophy of compartmentalising and thinking reductively about the body. Acupuncture nomenclature, on the other hand, appears to be consistent in highlighting recurring anatomical features across the body, and in drawing attention to blood flow and interconnections both within the body; and between the body and the external world (for example, *tian* as a name that designates the upper-body but does so through ecological reference to the sky or outer space, or *tianxia* which designates the whole body but also makes ecological reference to both the whole world and the whole of China).

The hypothesis that acupuncture is underpinned by careful and systematic anatomical investigation has intriguing implications for scholars of Chinese medicine as well as those in biomedicine. For example, if acupuncture has its roots in detailed anatomical investigation, might phenomena such as *Qi* have foundations in human anatomical structure in addition to intersubjective experience? Could interpreting anatomy in the context of a holistic worldview (as occurs in the case of acupuncture) offer new avenues for developing more holistic and ecologically-grounded approaches to health, wellbeing and the body in biomedical practice? Such thinking has the potential to open new fields of thought about bodily function and dysfunction. This is especially timely given emerging calls in the West to reframe health as a product of complex human interrelationships with natural (Coutts, Forkink, & Weiner, 2014), microbial (Benezra, DeStefano, & Gordon, 2012) and political economic (eco)systems (Ottersen et al., 2014). It may also lead to novel forms of therapy that move beyond the dichotomous choice of either targeted (often pharmaceutical and individualised) treatment or complementary (often holistic and social) approaches.

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Table 1: All acupuncture points which include the character 天 *tian* in their name.

Point no.	Standardised name (WHO 1993) Alternative point names (from Ellis *et al.* 1989; Translations by VS)	Acupuncture point location (proportional measurement is *cun* (a patient's thumb-width)) (WHO 2008)	Possible explanations of point name(s) following anatomical dissection (n=6; observed in 100% of cases unless stated otherwise)
Head face and neck			
GV20	百會 *bai hui* (Hundred Meeting) 天滿 *tian man* (Upper Fullness)	On the head, 5 *cun* superior to the anterior hairline, on the anterior median line	Arachnoid granulations on the dura over the superior sagittal sinus give a visual impression of convergence and fullness
BL7	通天 *tong tian* (Reaching Heaven) 通天 *tong tian* (Upper Connection) 天白 *tian bai* (Upper White) 天伯 *tian bo* (Upper Old Person) 天臼 *tian jiu* (Upper Bone Socket) 天舊 *tian jiu* (Upper Ancient)	On the head, 4 *cun* superior to the anterior hairline, 1 *cun* lateral to the anterior median line	Lies superficial to the frontal suture (connection, bones); in old age, the hair here is white (indicator of old age)
CV24	承漿 *cheng jian* Receiving Fluid 天池 *tian chi* (Upper Pool)	On the face, in the depression in the centre of the mentolabial sulcus	Sweat (and soup) can pool here
GB9	天衝 *tian chong* (Heaven Gushing) 天衝 *tian chong* (Upper Thoroughfare) 天沖 *tian chong* (Upper Surge) 天衢 *tian qu* (Upper Walking)	On the head, directly superior to the posterior border of the auricle, 2 *cun* superior to the hairline	Pulsation of the posterior auricular artery can be felt surging or flowing through here
SI17	天容 *tian rong* (Upper Abundance) 天容 *tian rong* (Upper Face)	In the anterior region of the neck, posterior to the angle of the mandible, in the depression anterior to the sternocleidomastoid muscle	Marks the facial artery
LI17	天鼎 *tian ding* (Heaven Ancient Cooking Vessel with Two Loop Handles) 天鼎 *tian ding* (Upper Cooking Pot) 天頂 *tian ding* (Upper Crown) 天項 *tian xiang* (Upper Nape)	On the anterior aspect of the neck, at the same level as the cricoid cartilage, just posterior to the border of the sternocleidomastoid muscle	*ding* 頂(crown) is a homophone of *ding* 鼎 (a traditional 3 legged cooking pot); this may be a reference to sternocleidomastoid looking like the legs to the cooking pot of the head
ST9	人迎 *ren ying* (Mankind Meet)	In the anterior region of the neck, at the same level as the superior border	Location of bifurcation of the carotid

Point no.	Standardised name (WHO 1993) Alternative point names (from Ellis *et al.* 1989; Translations by VS)	Acupuncture point location (proportional measurement is *cun* (a patient's thumb-width)) (WHO 2008)	Possible explanations of point name(s) following anatomical dissection (n=6; observed in 100% of cases unless stated otherwise)
	天五會 *tian wu hui* (Upper Five Convergences)	of the thyroid cartilage, anterior to the sternocleidomastoid muscle, over the bifurcation of the common carotid artery	artery, a major blood vessel to the face and brain
SI16	天窗 *tian chuang* (Upper Part Window) 天窗 *tian chuang* (Upper Window)	In the anterior region of the neck, posterior to the sternocleidomastoid muscle, at the same level as the superior border of the thyroid cartilage	
CV22	天突 *tian tu* (Heaven Chimney) 天突 *tian tu* (Upper Chimney) 天瞿 *tian ju* (Upper Startled)	In the anterior thoracic region, in the centre of the suprasternal fossa, on the anterior median line	Over the trachea as it descends into the mediastinum like a chimney
BL10	天柱 *tian zhu* (Heaven Pillar) 天柱 *tian zhu* (Upper Vertebra)	In the posterior region of the neck, at the same level as the superior border of the spinous process of the second cervical vertebra (C2), in the depression lateral to the trapezius muscle	Over the atlas (the upper vertebra)
TE16	天牖 *tian you* (Upper Window)	In the anterior region of the neck, at the same level as the angle of the mandible, in the depression posterior to the sternocleidomastoid muscle	
Body			
ST12	缺盆 *que pen* (Empty Basin) 天盖 *tian gai* (Upper Cover)	In the anterior region of the neck, in the greater supraclavicular fossa, 4 *cun* lateral to the anterior median line, in the depression superior to the clavicle	The investing cervical fascia forms a cover here
ST25	天樞 *tian shu* (Heaven Pivot) 天樞 *tian shu* (Upper Pivot)	On the upper abdomen, 2 *cun* lateral to the centre of the umbilicus	Most inferior of *tian* points (i.e. links upper and lower)
SP18	天谿 *tian xi* (Heaven Valley) 天谿 *tian xi* (Upper Ravine)	In the anterior thoracic region, in the 4th intercostal space, 6cm lateral to the anterior median line	Brachio-costal artery passes between axillary artery and the 4th intercostal space, as if flowing through a ravine
SI11	天宗 *tian zong* (Upper Respect) 天宗 *tian zong* (Upper Ancestor)	In the scapular region, in the depression between the upper one third and lower two thirds of the line connecting the midpoint of the spine of the scapula and the inferior angle of the scapula	
TE15	天髎 *tian liao* (Heaven Foramen) 天髎 *tian liao* (Upper Depression) 天聽 *tian ting* (Upper Hearing)	In the scapular region, in the depression superior to the superior angle of the scapula	Over insertion of levator scapulae, which forms a depression when the arm is abducted

Point no.	Standardised name (WHO 1993) Alternative point names (from Ellis *et al.* 1989; Translations by VS)	Acupuncture point location (proportional measurement is *cun* (a patient's thumb-width)) (WHO 2008)	Possible explanations of point name(s) following anatomical dissection (n=6; observed in 100% of cases unless stated otherwise)
PC1	天池 *tian chi* (Heaven Pool) 天池 *tian chi* (Upper Pool) 天會 *tian hui* (Upper Convergence)	In the anterior thoracic region, in the 4th intercostal space, 5 *cun* lateral to the anterior median line	
Upper limb			
PC2	天泉 *tian quan* (Heaven Spring) 天泉 *tian quan* (Celestial Spring) 天温 *tian wen* (Upper Warmth) 天濕 *tian shi* (Upper Moistness)	On the anterior aspect of the arm, between the two heads of biceps brachii, 2 *cun* distal to the anterior axillary fold	At the most proximal anterior portion of the arm; this area can often be moist and warm from sweat
LU3	天府 *tian fu* (Heaven Place) 天府 *tian fu* (Upper Storehouse)	On the anterolateral aspect of the arm, just lateral to the border of biceps brachii muscle, 3 *cun* inferior to the anterior axillary fold	
TE10	天井 *tian jing* (Heaven Well) 天井 *tian jing* (Upper Well)	On the posterior aspect of the elbow, in the depression 1 *cun* proximal to the prominence of the olecranon	

Table 2: All acupuncture points which include the character 下 *xia* in their name.

Point no.	Standardised name (WHO 1993) Alternative point names (from Ellis *et al.* 1989; Translations by VS)	Acupuncture point location (proportional measurement is *cun* (a patient's thumb-width)) (WHO 2008)	Possible explanations of point name(s) following anatomical dissection (n=6; observed in 100% of cases unless stated otherwise)
Torso and abdomen			
CV10	下腕 *xia wan* (Inferior Stomach) 下腕 *xia wan* (Lower Stomach) 下管 *xia guan* (Lower Duct)	On the upper abdomen, 2 *cun* superior to the centre of the umbilicus, on the anterior median line	On a transverse plane with the pyloric sphincter and the curve of the duodenum at the inferior portion of the stomach
KI11	横骨 *hen gu* (Henggu - the ancient name for the pubis) 下極 *xia ji* (Lower Extreme)	On the lower abdomen, 5 *cun* inferior to the centre of the umbilicus, 0.5 *cun* lateral to the anterior median line	Most inferior of the abdominal kidney points; on a transverse plane with the pubic ramus
CV6	氣海 *qi hai* (Primary Sea) 下肓 *xia huang* (Lower Fatty Tissue) 下氣海 *xia qi hai* (Lower Sea of Qi)	On the lower abdomen, 1.5 *cun* inferior to the centre of the umbilicus, on the anterior median line	This area is a focal point for meditation as the centre of qi or vital energy in the body; 'sea' here refers to a gathering point
CV4	關元 *guan wan* (Storage Primary qi) 下肓 *xia huang* (Lower Fatty Tissue) 下紀 *xia ji* (Lower Regulator)	On the lower abdomen, 3 *cun* inferior to the centre of the umbilicus, on the anterior median line	This area can be fatty
CV1	會陰 *hui yin* (Crossing Genitalia) 下極 *xia ji* (Lower Extreme) 下陰別 *xia yin bie* (Lower Yin Divergence)	In the perineal region, at the midpoint of the line connecting the anus and the posterior border of the scrotum in the male, and the posterior commissure of the labia majora in the female	The most inferior point on the torso; yin is inferior relative to yang
BL34	下髎 *xia liao* (Lower Foramen) 下髎 *xia liao* (Lower Foramen)	In the sacral region, in the fourth posterior sacral foramen	Most inferior of the sacral foramina
Lower limb			
ST36	足三里 *zu san li* (Lower Limbs Three Cun) 下陵 *xia ling* (Lower Mound) 下陵三里 *xia ling san li* (Lower Mound Three Miles)	On the anterior aspect of the leg, 3 *cun* distal to the inferior border of the patella, level with the tibial tuberosity, 1 finger's breadth lateral to the tibial crest	The tibial tuberosity is a bony prominence (mound) where the patellar ligament of the quadriceps muscle attaches to the tibia; dorsiflexion causes the anterior tibial muscle to bulge here

Point no.	Standardised name (WHO 1993) Alternative point names (from Ellis *et al.* 1989; Translations by VS)	Acupuncture point location (proportional measurement is *cun* (a patient's thumb-width)) (WHO 2008)	Possible explanations of point name(s) following anatomical dissection (n=6; observed in 100% of cases unless stated otherwise)
	下氣海 *xia qi hai* (Lower Sea of Qi) 下三里 *xia san li* (Lower Three Miles)		
ST39	下巨虛 *xia ju xu* (Lower Great Void) 下巨虛 *xia ju xu* (Lower Great Hollow) 下廉 *xia lian* (Lower Ridge)	On the anterior aspect of the leg, 9 *cun* distal to ST 35, on a line connecting ST35 with ST41	Shares a homologous name with L18; both form part of the *yang ming* division
SP6	三阴交 *san yin jiao* (Three Yin Meridians Crossing) 下三里 *xia san li* (Lower Three Miles)	On the tibial aspect of the leg, posterior to the medial border of the tibia, 3 *cun* superior to prominence of the medial malleolus	
BL60	崑崙 *kun lun* (Kunlun – a mountain in West China) 下崑崙 *xia kun lun* (Lower Kun Lun Mountains)	Midway between the high point of the external malleolus and tendocalcaneus	Kunlun Mountains (where the Yellow Emperor was said to reside) may be a reference to the high point of the external malleolus
Anomalous			
ST7	下關 *xia guan* (Lower Pass) 下關 *xia guan* (Lower Joint)	On the face, in the depression between the midpoint of the inferior border of the zygomatic arch and the mandibular notch	Inferior and anterior to the joint of the mandible
TE3	中渚 *zhong du* (Middle Water Margin) 下都 *xia du* (Lower Metropolis)	On the dorsum of the hand, between the 4th and 5th metacarpal bones, in the depression proximal to the 4th metacarpophalangeal joint	Most distal point on the hand, not including the fingers
LI8	下廉 *xia lian* (Inferior Edge) 下廉 *xia lian* (Lower Ridge)	On the posterolateral aspect of the forearm, on a line connecting LI5 with LI11, 4 *cun* distal to the cubital crease	Shares a homologous name with ST39 (on the lower limb); both form part of the *yang ming* division

Table 3: All acupuncture points which include the character 髎 *liao* in their name.

Point no.	Standardised name (WHO 1993) Alternative point names (from Ellis *et al.* 1989; Translations by VS)	Acupuncture point location (proportional measurement is *cun* (a patient's thumb-width)) (WHO 2008)	Possible explanations of point name(s) following anatomical dissection (n=6; observed in 100% of cases unless stated otherwise)
Eye and forehead			
GB1	瞳子髎 *tong zi liao* (Pupil Foramen) 瞳子髎 *tong zi liao* (Pupil Depression)	On the head, in the depression 0.5 *cun* lateral to the outer canthus of the eye	In depression lateral to the orbital over the pterion in line with the pupil
ST1	承泣 *cheng qi* (Receive Tears) 面髎 *mian liao* (Face Foramen)	On the face, between the eyeball and the infraorbital margin, directly inferior to the pupil	Inside the eye socket, over the bony canal leading from the infraorbital fissure to the infraorbital foramen; where tears collect in the bottom of the eyelid
TE23	絲竹空 *si zhu kong* (Slender Bamboo Space) 巨髎 *ju liao* (Great Depression) 目髎 *mu liao* (Eye Depression) 月髎 *yue liao* (Moon Depression)	On the head, in the depression at the lateral end of the eyebrow	In the curved depression lateral and superior to the orbital ridge; the shape of the bony curve resembles a sickle moon
GB13	本神 (Essential Mind) 肋髎 *lei liao* (Rib Foramen)	On the head, 0.5 *cun* anterior to the anterior hairline, 3 *cun* lateral to the anterior median line	
Face and jaw			
ST3	巨髎 *ju liao* (Huge Foramen) 巨髎 *ju liao* (Great Fossa)	On the face, directly inferior to the pupil, lateral to the inferior border of the ala of the nose	In the infratemporal fossa
SI18	顴髎 *quan liao* (Zygoma Foramen) 顴髎 *quan liao* (Cheek Fossa) 權髎 *quan liao* (Influential Fossa) 椎髎 *zhui liao* (Hammer Fossa)	On the face, inferior to the zygomatic bone, in the depression directly inferior to the outer canthus of the eye,	In the infratemporal fossa
TE22	耳和髎 *er he liao* (Ear Harmony Foramen) 耳和髎 *er he liao* (Ear Harmony Depression)	On the head, posterior to the temple hairline, anterior to the auricular root, posterior to the superficial temporal artery	Depression is found on the posterior border of temporalis when the jaw is opened and shut; it is used to treat ear problems

Point no.	Standardised name (WHO 1993) Alternative point names (from Ellis *et al.* 1989; Translations by VS)	Acupuncture point location (proportional measurement is *cun* (a patient's thumb-width)) (WHO 2008)	Possible explanations of point name(s) following anatomical dissection (n=6; observed in 100% of cases unless stated otherwise)
	和髎 *he liao* (Harmony Depression)		
LI19	口禾髎 *kou he liao* (Mouth Grain Foramen) 口禾髎 *kou he liao* (Mouth Grain Foramen) 長髎 *chang liao* (Long Foramen)	On the face, at the same level as the midpoint of the philtrum, inferior to the lateral margin of the nostril	In the bony groove between the roots of the incisor and first molar where food can get stuck
Upper limb and torso			
LI12	肘髎 *zhou liao* (Elbow Foramen) 肘髎 *zhou liao* (Elbow Depression)	On the posterolateral aspect of the elbow, proximal to the lateral epicondyle of the humerus, anterior to the lateral supraepicondylar ridge	In the depression proximal to the high point of the muscle over the elbow joint
TE13	臑會 *nao hui* (Muscle Prominence of the Upper Arm Confluence) 臑髎 *nao liao* (Upper Arm Depression)	On the posterior aspect of the arm, posteroinferior to the border of the deltoid muscle, 3 *cun* inferior to the acromial angle	In the fascial plane between deltoid and triceps
TE14	肩髎 *jian liao* (Shoulder Foramen) 肩髎 *jian liao* (Shoulder Depression)	On the shoulder girdle, in the depression between the acromial angle and the greater tubercle of the humerus	With the arm fully abducted; a depression is found in the joint crease between the humerus and scapula
TE15	天髎 *tian liao* (Heaven Foramen) 天髎 *tian liao* (Upper Depression)	In the scapular region, in the depression superior to the superior angle of the scapula	At the insertion of levator scapulae; a depression is felt when the arm is abducted
LR13	章門 *zhang men* (Screen Door) 肪髎 *fang liao* (Lard Depression)	On the lateral abdomen, inferior to the free extremity of the 11th rib	On palpation the point is found where the finger slides off the tip of the bone onto the flesh; this is often a fatty area
Lower limb			
GB29	居髎 *ju liao* (Reside Foramen) 居髎 *ju liao* (Squatting Depression)	In the buttock region, midpoint of the line connecting the anterior superior iliac spine and the prominence of the greater trochanter	On the crease formed over the hip when squatting
GB35	陽交 *yang jiao* (Yang Crossing) 足髎 *zu liao* (Leg Depression)*	On the fibular aspect of the leg, posterior to the fibula, 7 *cun* proximal to the prominence of the lateral malleolus	In the fascial plane between the fibula and gastrocnemius
Sacral foramina			
BL31	上髎 *shang liao* (Upper Foramen)	In the sacral region, in the 1st posterior sacral foramen	In the 1st sacral foramen

Point no.	Standardised name (WHO 1993) Alternative point names (from Ellis *et al.* 1989; Translations by VS)	Acupuncture point location (proportional measurement is *cun* (a patient's thumb-width)) (WHO 2008)	Possible explanations of point name(s) following anatomical dissection (n=6; observed in 100% of cases unless stated otherwise)
	上髎 *shang liao* (Upper Foramen)		
BL32	次髎 *ci liao* (Second Foramen) 次髎 *ci liao* (Second Foramen)	In the sacral region, in the 2st posterior sacral foramen	In the 2nd sacral foramen
BL33	中髎 *zhong liao* (Middle Foramen) 中髎 *zhong liao* (Central Foramen)	In the sacral region, in the 3st posterior sacral foramen	In the 3rd sacral foramen
BL34	下髎 *xia liao* (Lower Foramen) 下髎 *xia liao* (Lower Foramen)	In the sacral region, in the 4st posterior sacral foramen	In the 4th sacral foramen

Table 4a: All acupuncture points which include the character 飛 *fei* in their name.

Point no.	Standardised name (WHO 1993) Alternative point names (from Ellis *et al.* 1989; Translations by VS)	Acupuncture point location (proportional measurement is *cun* (a patient's thumb-width)) (WHO 2008)	Possible explanations of point name(s) following anatomical dissection (n=6; observed in 100% of cases unless stated otherwise)
BL58	飛陽 *fei yang* (To Fly Lifting) 飛陽 *fei yang* (Flying Yang)	On the posterolateral aspect of the leg, between the inferior border of the lateral head of gastrocnemius muscle and the calcaneal tendon, 7cm proximal to the high point of the lateral malleolus	Divergent branch of sural nerve 'flies' off of the main branch, leads lateral border of popliteal fossa
TE6	支溝 *zhi gou* (Limbs Ditch) 飛虎 *fei hu* (Flying Tiger)	3cm proximal to the dorsal wrist crease between the radius and ulna on the radial side of extensor digitorum	Radial nerve travels or 'flies' in the extensor compartment along the forearm

Table 4b: All acupuncture points which include the character 委 *wei* in their name.

Point no.	Standardised name (WHO 1993) Alternative point names (from Ellis *et al.* 1989; Translations by VS)	Acupuncture point location (proportional measurement is *cun* (a patient's thumb-width)) (WHO 2008)	Possible explanations of point name(s) following anatomical dissection (n=6; observed in 100% of cases unless stated otherwise)
BL39	委陽 *wei yang* (Crooked Yang) 委陽 *wei yang* (Bend Yang)	On the posterolateral aspect of the knee, just medial to the biceps femoris tendon in the popliteal crease	Where the lateral cutaneous sural nerve meets the fibular nerve in the popliteal fossa; where the knee crease is on flexion
BL40	委中 *wei zhong* (Crooked Middle) 委中 *wei zhong* (Bend Middle)	On the posterior aspect of the knee, at the midpoint of the popliteal crease	Where the sural nerve and short saphenous vein arrive in the popliteal fossa; where the knee crease is on flexion

Table 5: All acupuncture points which include the character 谿 *xi* in their name.

Point no.	Standardised name (WHO 2008) Alternative point names (from Ellis *et al.* 1989; translated by VS)	Acupuncture point location (proportional measurement is *cun* (a patient's thumb-width)) (WHO 2008)	Possible explanations of point name(s) following anatomical dissection (n=6; observed in 100% of cases unless stated otherwise)
Head and face			
ST1	承泣 *cheng qi* (Receive Tears) 谿穴 *xi xue* (Ravine Cave)	On the face, between the eyeball and the infraorbital margin, directly inferior to the pupil	Inside the eye socket, over the bony canal leading from the infraorbital fissure to the infraorbital foramen; where tears collect in the bottom of the eyelid
GV16	風府 *feng fu* (Pathogenic Wind Place) 曹谿 *cao xi* (Ministry Official's Ravine)	In the posterior region of the neck, directly inferior to the occipital protuberance, in the depression between the trapezius muscles	The anastomosis of the vertebral arteries to make the basilar artery lie deep to this point; the two vertebral arteries could be analogous to government officials who support the main basilar artery leading into the brain
Upper limb			
LI5	陽谿 *yang xi* (Yang Brook) 陽谿 *yang xi* (Yang Ravine)	On the posterolateral aspect of the wrist, at the radial side of the wrist crease, distal to the radial styloid process, in the depression of the anatomical snuffbox	Where the radial artery crosses under brachioradialis tendon slip to the dorsum of the wrist; it flows in a space bounded on both sides by the radial and scaphoid bones
Body			
SP18	天谿 *tian xi* (Heaven Valley) 天谿 *tian xi* (Upper Ravine)	In the anterior thoracic region, in the 4th intercostal space, 6cm lateral to the anterior median line	In the upper part of the body, the brachio-costal artery passes between axillary artery and the 4th intercostal space to disappear into the thorax
ST25	天樞 *tian shu* (Heaven Pivot) 長谿 *chang xi* (Long Ravine)	On the abdomen, 2 *cun* lateral to the centre of the umbilicus	Point lies between two long muscle bellies of rectus abdominus in which the inferior epigastric vessels are also situated
ST29	歸來 *gui lai* (Return Arrival) 谿 *xi gu* (Ravine Valley) 谿穴 *xi xue* (Ravine Hole/Cave)	On the lower abdomen, 4 *cun* inferior to the centre of the umbilicus, 2 *cun* lateral to the anterior median line, level with CV3	The tributaries of the inferior epigastric vessels in the rectus abdominus muscle join together to form a single vessel which plunges into the abdomen to anastomose with the external iliac vessels like a river plunging below the surface to join with a main underground river
Lower limb			
KI3	太谿 *tai xi* (Great Canyon) 太谿 *tai xi* (Great Ravine)	On the posterolateral aspect of the ankle, in the depression between the prominence of the medial malleolus and the calcaneal tendon	Posterior tibial vessels and nerve pass deep in the 'valley' between the malleolus and the Achilles tendon

Point no.	Standardised name (WHO 2008) Alternative point names (from Ellis *et al.* 1989; translated by VS)	Acupuncture point location (proportional measurement is *cun* (a patient's thumb-width)) (WHO 2008)	Possible explanations of point name(s) following anatomical dissection (n=6; observed in 100% of cases unless stated otherwise)
ST41	解谿 *jie xi* (Separation Stream) 解谿 *jie xi* (Divided Ravine)	On the anterior aspect of the ankle, in the depression at the centre of the front surface ankle joint, between the tendons of extensor hallucis longus and extensor digitorum longus	Anterior tibial vessel enters the dorsum of the foot through this space where the tendons form the sides of a 'valley'
GB43	俠谿 *xia xi* (Pinched Ravine)	On the dorsum of the foot, between the 4th and 5th toes, proximal to the web margin, at the border of the red and white flesh	Blood vessels and nerve to 4^{th} and 5^{th} toes travel through a narrow space here

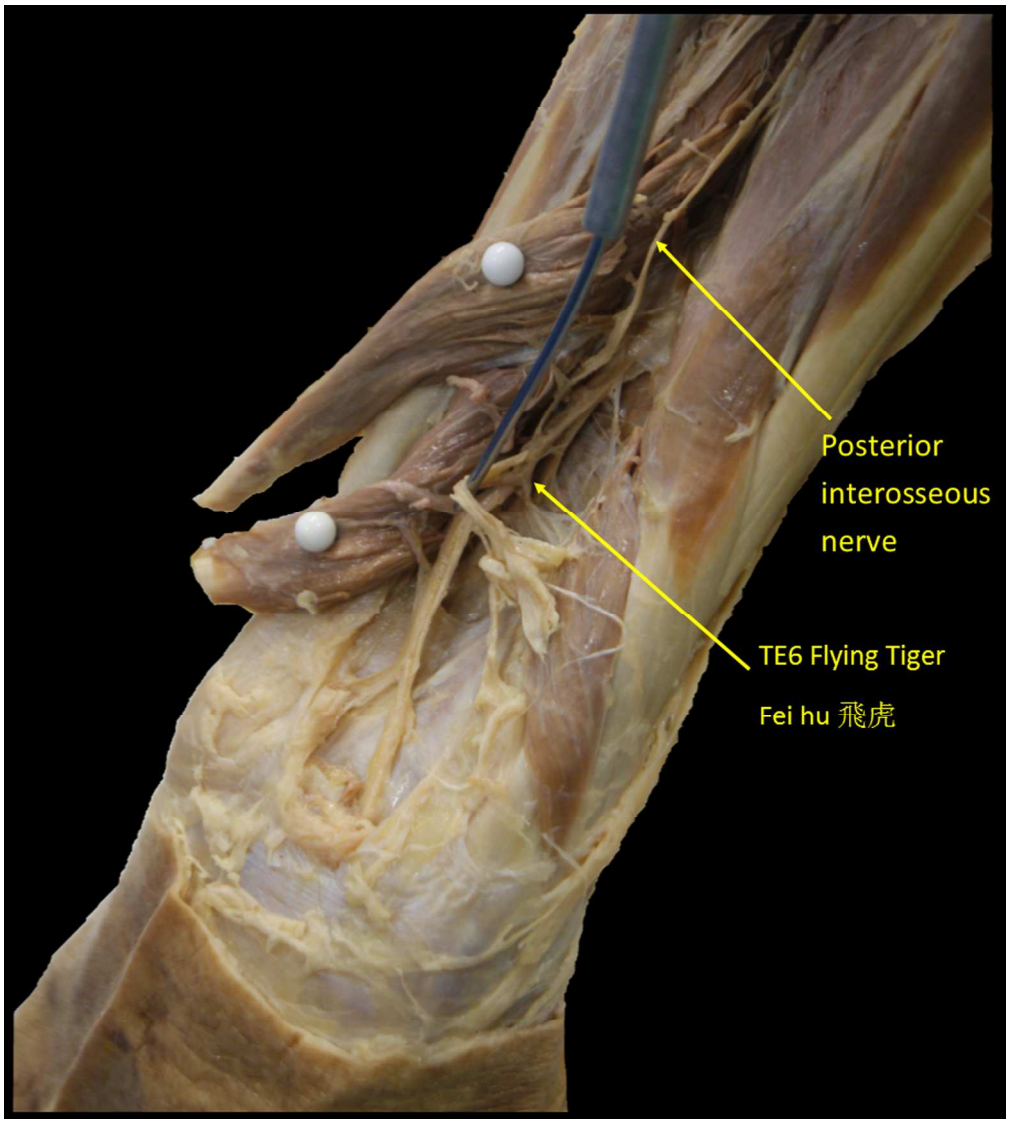

Figure 1: Dissection of the dorsal forearm of an embalmed cadaver at Flying Tiger (TE6) indicates posterior interosseous nerve 'flying' away from the main neurovascular bundle to pass through the extensor muscles of the dorsal forearm.
258x287mm (300 x 300 DPI)

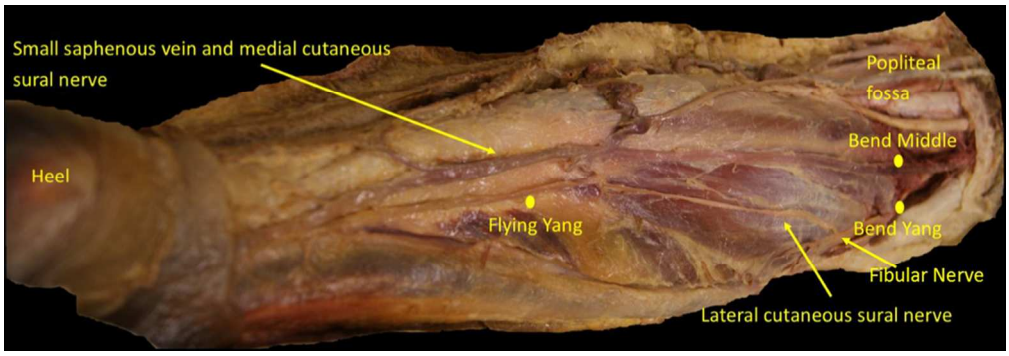

Figure 2: Dissection of the posterior leg of an embalmed cadaver indicates the positioning of Flying Yang (BL58) and Bend Yang (BL39) over the lateral cutaneous sural nerve where it 'flies' away from the midline to join the fibular nerve. Bend Middle (BL40) is also shown in the popliteal fossa medial to Bend Yang (BL39); these two points are the only two uses of the character meaning 'Bend'.
93x32mm (300 x 300 DPI)

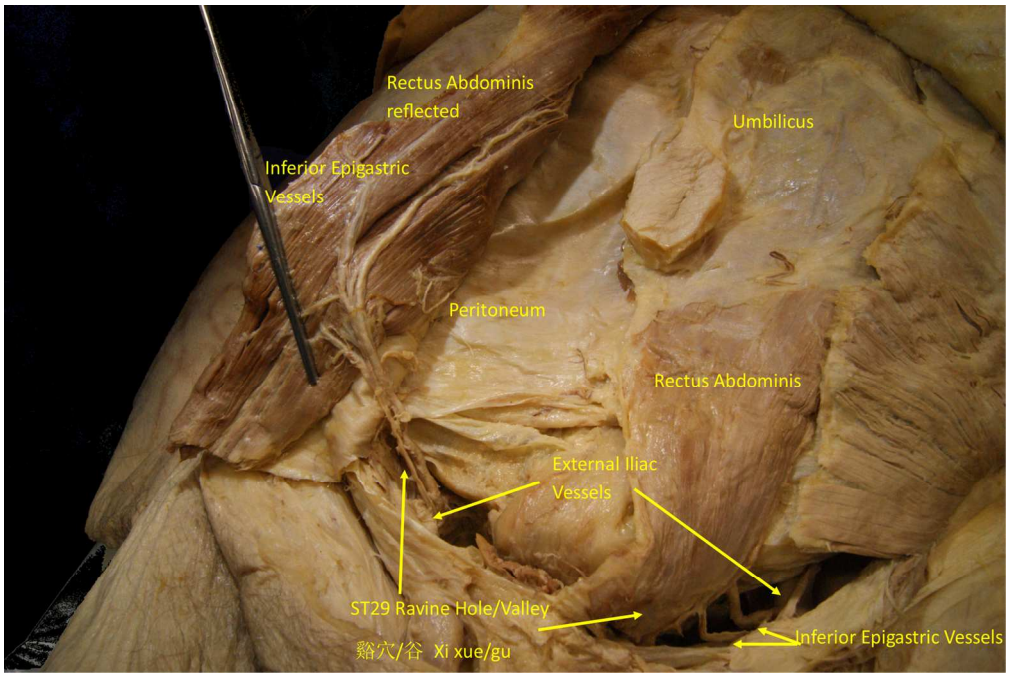

Figure 3: Dissection of the abdomen of an embalmed cadaver at Ravine Hole/Valley (ST29) shows inferior epigastric vessels running between two bellies of rectus abdominis. They appear as tributaries which join together to form larger vessels descending into the abdomen to form an anastomosis with the external iliac vessels. There is no indication in Chinese terminology of directionality of flow (flow would be difficult to observe if research was being carried out on cadavers).
169x112mm (300 x 300 DPI)

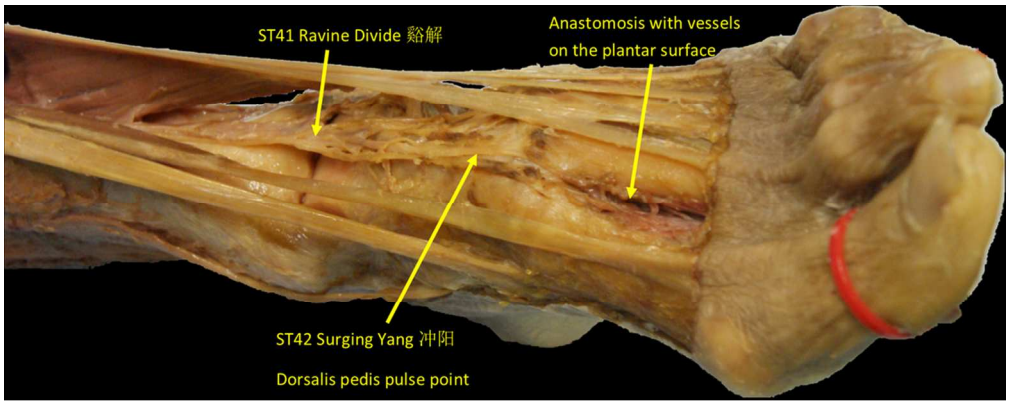

Figure 4: Dissection of the anterior leg and foot of an embalmed cadaver at Ravine Divide (ST41) shows the anterior tibial vessels emerging from beneath extensor digitorum longus to pass over the ankle, between extensor digitorum longus and extensor hallucis longus, whose tendons form a high-sided 'valley' through which the vessel passes.
105x41mm (300 x 300 DPI)

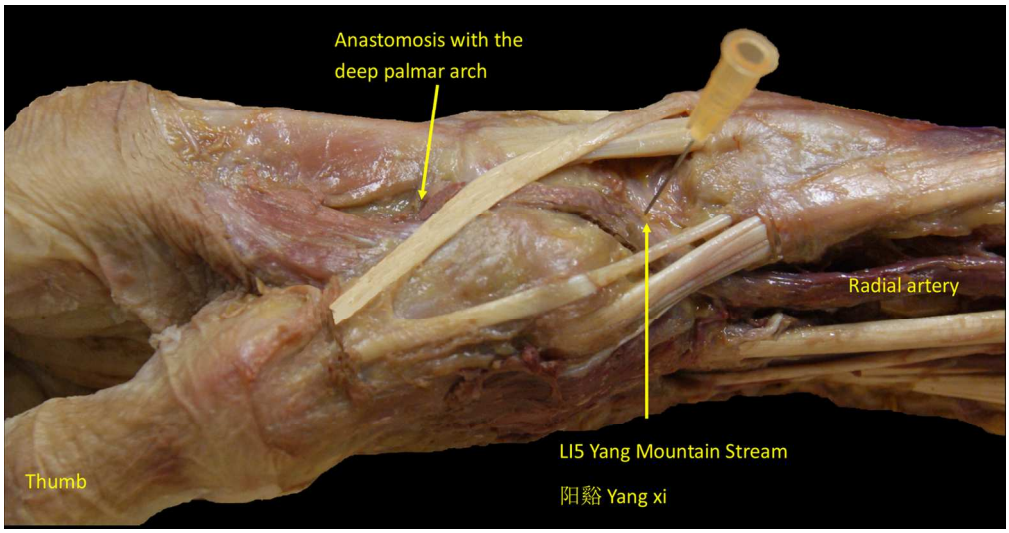

Figure 5: Dissection of the forearm and wrist of an embalmed cadaver at Yang Ravine (LI5) shows the radial artery passes under the tendon slip of brachioradialis into the anatomical snuffbox, where it flows between the radius and scaphoid bones before it plunges between the first and second interosseus muscles towards the deep palmar arch of the hand.
143x75mm (300 x 300 DPI)