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นิพนธ์ต้นฉบับ

Anatomical Locations in the Upper Limbs that Correlate with the Basic Massage Lines and Signaling Points of Nuad Thai

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Abstract

This study aimed to identify anatomical structures and locations, from superficial to deep layers, that correlate to basic massage lines (BLs) and signaling points (SPs) in the upper limbs (arms and shoulders) based on the court-type Nuad Thai. This was achieved through bimanual palpation of two healthy volunteers and the dissection of ten upper limbs of cadavers. The study was performed in the Anatomy Laboratory at Mahasarakham University Faculty of Medicine. The results showed that *Poed Pratu Lom* (เปิดประตูลม) points in the upper limbs correspond to brachial arteries that run between and along the upper arm muscles and nerves brachial plexus running through the lower arms. The BLs correspond to the longitudinal muscles from the muscular origins to the muscular insertion, as well as the arteries and nerves between the muscles. The basic points for shoulder massage correspond to the vessels and nerves entering the underneath infraspinatus muscle. SPs run in the same direction as the blood vessels, where the artery and nerves disappear into the hands through the wrists. The location of the SPs correspond to the muscular origins, where the arteries and nerves penetrate into the muscles, and where the nerves travels between the muscles and associates with the elbows and shoulder joints. In conclusion, upper limb BLs and SPs used in court-type Nuad Thai (Thai traditional massage) are associated with or closely related to important muscle anatomical structures, especially blood vessels, nerves, muscles, and joints.

Keywords: Nuad Thai, basic massage lines, signaling points, *Poed Pratu Lom* (เปิดประตูลม) points

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บทคัดย่อ

ตำแหน่งทางกายวิภาคกับแนวเส้นพื้นฐานและจุดสัญญาณของการนวดไทยในรยางค์บน

ณรงค์ศักดิ์ จันทะวัง*, กฤษณา หอมวุฒิวงศ์, นุชนาถ ไหมหรือ, สุรเชษฐ์ คงศรี, วีรชัย เหร่าหมัด, ณัฐพล ลาภยืนยง

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การวิจัยนี้เป็นการศึกษาเชิงพรรณนา มีวัตถุประสงค์เพื่อศึกษาตำแหน่งและโครงสร้างทางกายวิภาคกับแนวเส้นพื้นฐานและจุดสัญญาณของการนวดราชสำนักในรยางค์บน (แขนและหัวไหล่) จากส่วนตื้นจนถึงส่วนลึก โดยการคลำและนวดในแนวเส้นพื้นฐาน จุดสัญญาณในแขนและหัวไหล่ ในอาสาสมัคร 2 ราย และชำแหละศพดอง 5 ศพ เพื่อเปรียบเทียบกัน พร้อมชี้ตำแหน่งโครงสร้างเนื้อเยื่อเบื้องต้นในร่างกาย เก็บข้อมูล ณ ห้องปฏิบัติการกายวิภาคศาสตร์ คณะแพทยศาสตร์ มหาวิทยาลัยมหาสารคาม ผลการศึกษาพบว่า จุดที่เปิดประตูลมตามวิธีการนวดไทยตรงกับตำแหน่งของหลอดเลือดแดงใหญ่ (brachial artery) ซึ่งอยู่ระหว่างกล้ามเนื้อต้นแขน และตรงกับเส้นประสาทจาก brachial plexus ซึ่งทอดผ่านไปยังแขนท่อนล่าง แนวเส้นพื้นฐานนี้อยู่ใกล้เคียงหรืออยู่บนตำแหน่งตามยาวของมัดกล้ามเนื้อและเอ็นจากจุดเกาะต้น (origin) ไปยังจุดเกาะปลาย (insertion) นอกจากนี้ยังพบว่าตรงกับหลอดเลือดและเส้นประสาทซึ่งทอดอยู่ใต้มัดกล้ามเนื้อ จุดพื้นฐานของการนวดหัวไหล่ตรงกับตำแหน่งของหลอดเลือดและเส้นประสาทที่ปักเข้าใต้ต่อมัดกล้ามเนื้อ ส่วนจุดสัญญาณตรงกับตำแหน่งมัดกล้ามเนื้อบริเวณใกล้จุดเกาะต้นหรืออยู่ระหว่างมัดกล้ามเนื้อ พบหลอดเลือด รากประสาทและเส้นประสาท หรือแขนงของหลอดเลือดและเส้นประสาทกระจายหรือปักเข้ากล้ามเนื้อ และยังตรงกับตำแหน่งของข้อต่อ ดังนั้นสรุปว่าการนวดตามจุด แนวเส้นพื้นฐาน และจุดสัญญาณในแขนและหัวไหล่ มีความสอดคล้องกับตำแหน่งทางกายวิภาคของกล้ามเนื้อ หลอดเลือด รากประสาท เส้นประสาท และข้อต่อ ผลการศึกษาดังกล่าวเป็นความรู้พื้นฐานต่อการรักษาผู้ป่วยด้วยการนวดไทยแบบราชสำนักต่อไป

คำสำคัญ : การนวดไทย, แนวเส้นพื้นฐาน, จุดสัญญาณ, จุดเปิดประตูลม

Introduction

Court type Thai traditional massage (CTTM) is a very important component of Thai Traditional Medicine. It combines hot herbal compress and therapeutic massage to treat several CTTM diseases of the upper limb[1-3], namely paralysis, frozen shoulder, *Lom Phai Phat Tha Khat* (ลมปลายปัตฆาต) (diseases caused by blood clots in the blood vessels of the muscle belly, tendons and the attachment points of the muscles[1-3]), *Lom Prabh* (ลมปราบ) (idiopathic diseases that give rise to the muscle inflammation and atrophy, respectively[1-3]), *Lom Lam Bong* (ลมลำบอง) (joint inflammation caused by food and climate[1-3]) and *Sannibaat* (สันนิบาต) (wrist paralysis caused by poor blood circulation of the hand with long term contact low temperature[1]).

CTTM involves the use of thumb(s) and hands to apply pressure to the Massage Points (MPs), The Signaling Points (SPs; important points located along the points and basic massage lines that can be used in therapeutic massage according to the coordinates points of CTTM)[1-5]. MPs of the upper limbs comprise *Poed Pratu Lom* points (points on the blood vessels used for distribution of blood flow and heat to the peripheral organs, Figure 1) and basic points for shoulder massage[1-4] (BSP, Figure 2).

SPs are important points for manual therapy in CTTM. According to *Sen Prathan Sib* ('sib' means ten, and 'sen prathan' means primary energy line)[6] theory of Thai traditional massage, SPs distribute blood flow and regulate blood and heat throughout the upper limbs. There are 50 SPs in the whole body, with 15 of these located in the upper limbs[1-5]. SPs in the upper limb comprise inner signaling points (ISPs), which are numbered 1-5 (Figure 3), outer signaling points (OSPs) also numbered 1 to 5, and shoulder signaling points (SSPs) numbered 1 to 5[1, 5].

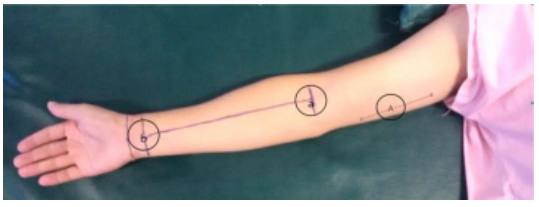

Figure 1 Anterior aspect of a right upper limb showing the locations of *Poed Pratu Lom* point (A) and BLIF (a to b).

Figure 2 Posterior aspect of a right upper limb showing the locations of BSP or SSP1 (S), OSP1 (1), and OSP2 (2).

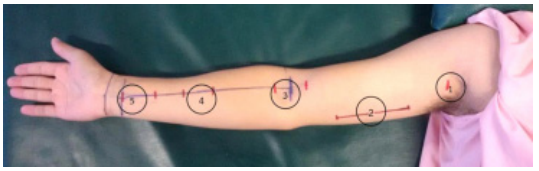

Figure 3 Anterior aspect of a right upper limb showing the locations of ISP1 (1), ISP2 (2), ISP3 (3), ISP4 (4) and ISP5 (5).

Basic massage Lines (BLs) are important lines for relaxation and preparation for CTTM. BLs of the upper limb comprise a basic line of the inner forearm (BLIF), a basic line of the outer arm (BLOA), and a basic line of the outer forearm (BLOF)[1-4]. One previous study has shown that MPs correspond to the

muscular origin and proximal parts of the arteries penetrating into muscles. SPs were found along the muscular origins, where the artery and nerve branches enter and supply them (motor points). In the lower limb, both MPs and SPs were found along the border of the iliotibial tract, where the arteries and nerves pierce and supply the muscles and associate with the hip joint. BLs follow the longitudinal arrangement of the muscle from the origins to the insertions, and parallel the course of the artery and nerve that correspond to the border of the iliotibial tract[7].

Studies correlating CTTM with anatomical structures are few in number. Our previous study focused on the lower limbs only, while the upper limbs have not yet been studied. Therefore, this study sought to determine how anatomical structures of the upper limbs correlate with the MPs, SPs, and BLs of CTTM. Detailed knowledge of this correlation will help CTTM practitioners locate the correct points and lines for therapeutic massage, and promote a deeper understanding of how CTTM relates to tissues and organs of the body.

Methodology

This study was performed in the Anatomy Laboratory at the Faculty of Medicine, Mahasarakham University, Thailand from January to May, 2016. The study was approved by the Ethics Committee of Mahasarakham University (Ref. no 016/2016). Participants were 42 anatomically unremarkable Applied Thai Traditional Medicine students (10 males, 32 females) and 5 cadavers (3 male, 2 females) of Thai nationality. The dimensions of the thumbs and heels of the hands were measured using a tape measure and mean values were calculated (CTTM practice in the upper limbs involves use of the thumb and heel of the hand to press on points and lines.). These values were used to locate points, BLs and SPs in the upper limbs in this study.

The MPs, SPs and BLs were located and marked on the 4 upper limbs of two healthy volunteers (1 male, 1 female) and 10 upper limbs of five cadavers by a specialist in Applied Thai Traditional Medicine to determine the effects of applying pressure to the same points and lines of the upper limbs. The cadavers were dissected according to laboratory guidelines based on Cunningham's Manual of Practical Anatomy. Massage points in the upper limbs comprise the *Poed Pratu Lom* points, basic points for shoulder massage (BSP) and all of the signaling points (SPs). These were the inner signaling points 1 to 5, outer signaling points 1 to 5, and the shoulder signaling points 1 to 5. Important positions were categorized as described below.

1) Points considered to be both massage points and SPs (ie. *Poed Pratu Lom* point, ISP2, BSP, and SSP1)

Poed Pratu Lom (เปิดประตูลม) point is located at the middle point of the medial arm that corresponds to ISP2[1,4,5] (Figure 1).

BSP is the intersecting point between a vertical line passing through the posterior angle of the acromion process and a posterior horizontal axillary line approximately 1 fingerbreadth (2 cm) below the posterior axillary fold that corresponds to SSP1[1,4,5] (Figure 2).

2) Signaling points

ISP1 is the intersecting point between a vertical line passing through the anterior angle of the acromion process and an anterior horizontal axillary line adjacent to the anterior axillary fold (Figure 3). ISP3 is the middle point of the elbow joint and lies in front of the elbow (Figure 3). ISP4 is the middle point of the forearm and lies in front of the forearm (Figure 3). ISP5 is approximately 1 fingerbreadth (2 cm) above the carpal joint, and lies in front of the forearm[1,5] (Figure 3).

OSP1 is the intersecting point between a vertical line passing through the posterior angle of the acromion process and a posterior axillary line with a posterior horizontal axillary line adjacent to the posterior axillary fold. OSP2 is the intersecting point between an imaginary vertical line and horizontal line. The vertical line passes through the posterior axillary line, whereas the horizontal line passes through and lies behind the end of the deltoid muscle (Figure 2). OSP3 is adjacent to the lateral epicondyle, while the arm flexes at an angle of approximately 90^{o} (Figure 4). OSP4 is the point adjacent to the medial epicondyle, while the arm flex at an angle of approximately 90^{o}. OSP5 is the intersecting point between an imaginary vertical line and horizontal line. The vertical line passes through the midline of the forearm, whereas the horizontal line is drawn approximately two fifths of the way down the forearm from the lateral epicondyle, when the arm is flexing at an angle of approximately 135^{o} [1, 5] (Figure 4).

SSP2 is the intersecting point of a vertical line passing through the lobule of the ear with a horizontal line drawn adjacent to the angle of the chin (Figure 5). SSP3 lies approximately one fingerbreadth inferior to SSP2.

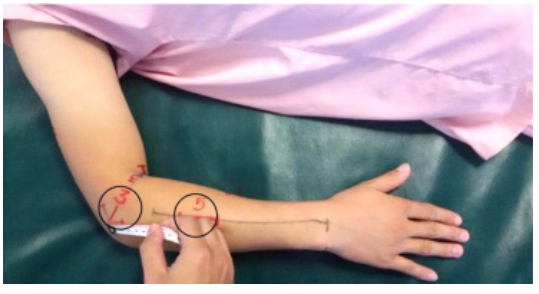

Figure 4 Posterolateral aspect of a right upper limb showing the locations of OSP3 (3) and OSP5 (5).

Figure 5 Lateral aspect of the neck showing the locations of SSP2 (2), SSP3 (3) and SSP4 (4).

SSP4 is the intersecting point of a vertical line passing through the midclavicular line with a horizontal drawn adjacent to the upper border of the clavicle (Figure 5). SSP5 is the middle point of the axillary fossa[1,5].

3) BLs of the upper limb (ie. BLIF, BLOA, and BLOF)

BLIF (Figure 1) is an imaginary line drawn from adjacent the middle point of the elbow to a point approximately one fingerbreadth (2 cm) proximal to the wrist crease. BLOA is a line drawn from OSP2 to a point approximately 3 fingerbreadths (6 cm) proximal of the upper part of the olecranon process (Figure 6)[1,4].

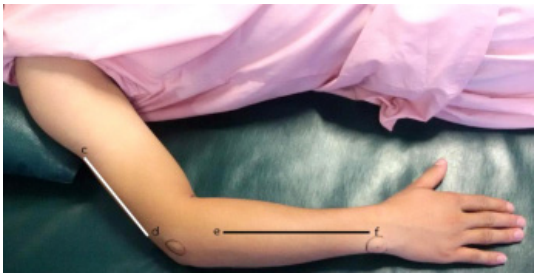

Figure 6 Lateral aspect of a right arm showing the location of BLOA (c to d) and BLOF (e to f).

BLOF is an imaginary line drawn from approximately one fingerbreadth (2 cm) below the lateral epicondyle and midline of the forearm to the ulna head[1,4] (Figure 6).

All of the above points and lines were palpated and identified in the volunteers, and compared with the dissection cadavers. Superficial structures were examined first, then deeper structures. Photographs were taken of all the structures.

Results

The average dimensions of thumbs and the heel of the hands were 2.1 cm and 9.2 cm, respectively. These dimensions were used to locate points, BLs and SPs in the upper limbs in this study.

The location of structures did not differ between cadavers of male and female.

Table 1. The ISP2, SSP1 and the structures correlation in the cadavers.

Points	Muscles	Vessels	Nerves (N)
ISP2	biceps brachii	brachial	median
SSP1	infraspinatus	suprascapular	

Points considered to be both massage points and SPs

In the volunteers, the radial arterial pulse could be palpated at the *Poed Pratu Lom* Point (ISP2). After removing the arm skin from the cadavers, the *Poed Pratu Lom* Point was seen between the short head of the biceps brachii muscle (SBB) and the medial head of the triceps brachii muscle (MeTB), where the brachial vessels and median nerve (MN) descended to the elbow joint. This was confirmed by pressing on this point in volunteers, which led to a decrease in the radial arterial pulse (Table 1).

The BSP or SSP1 could be palpated at the lateral margin of the scapula in the volunteers. Removing the skin from the cadaver showed that BSP and SSP1 were at the inferior border of the infraspinatus muscle at a location adjacent to the superior border of the teres minor muscle, where the suprascapular vessels and the suprascapular nerve pierce and supply the infraspinatus muscle (Figure 7 and Table 1).

The signaling points

In the volunteers, ISP1 could be palpated at the base of U in the anterior axillary fold of the pectoralis major muscle. In the cadaver, ISP1 was located at the 3rd part of the axillary artery (AA, Figure 8). This point was confirmed by pressing in the volunteer, which led to a diminishing of the radial arterial pulse (Table 2).

ISP3 could be palpated at the bicipital aponeurosis and brachial arterial pulse in the volunteers. In the cadaver, ISP3 corresponded to where the median cubital vein and brachial vessels were situated in the cubital fossa under the bicipital aponeurosis. Deeper dissection showed the articular capsule, namely the humeroulnar and humeroradial ligaments of the elbow joint (Figure 9 and Table 2).

In the volunteers, the flexor carpi radialis (FCR) tendon could be palpated at ISP4. At superficial level dissection in the cadaver, ISP4 was seen between the medial border of the FCR and palmaris longus (PL) tendons and the lateral border of the brachioradialis (Bra) tendon. At an intermediate level, ISP4 was located at the superior part of the flexor digitorum superficialis (FDS) muscle, where the median nerve (MN) descends through the deep surface of the FDS. After deeper dissection, ISP4 location was found to correspond to the anterior interosseous artery (AIA), and the anterior interosseous nerve (AIN), which

Table 2. The ISP1, ISP3, ISP4, ISP5, OSP1 to OSP5, SSP2 to SSP5 and the structures correlation in the cadavers.

Points	Muscles	Vessels	Nerves (N)	joints
ISP1	- pectoralis major	- axillary	- median	-
ISP3	- bicipital aponeurosis of biceps brachii	- brachial	- median	- elbow
ISP4	- muscle tendons of the anterior compartment of forearm	- anterior interosseous		-
ISP5				-
OSP1	- teres minor	-	- nerve to teres minor (axiiary)	-
OSP2	- triceps brachii	- profunda brachii	- radial	-
OSP3	- extensor carpi radialis longus	-	- radial	- elbow
OSP4	- pronator teres	-	-	
OSP5	- extensor digitorum (superficial (level) - supinator (deep level)	- posterior interosseous		-
SSP2	- posterior border of sternocleidomastoid (superficial level)	-	- CN XI and nerves roots of brachial plexus	-
SSP3	- scalenes (deep level)	-		-
SSP4	- omohyoid	- subclavian	- nerve trunks of the brachial plexus	-
SSP5	-	- axillary		- glenohemoral

were seen under the flexor digitorum profundus (FDP) muscle and continued in front of the interosseous membrane (IM; Table 2).

ISP5 could be palpated at the PL tendon in the volunteers. In the cadavers, ISP5 was at the PL tendon, at a location in front of the flexor retinaculum (FR) where the tendons of the FCR, flexor policis longus (FPL), FDS and FDP as well as the MN were seen under the FR. MN passed through the carpal tunnel between the FR and lateral margin of the FDS tendon in the hand. After dissecting deeper, AIA and AIN were seen at the entering point of the pronator quadratus and innervated it as well (Figure 10 and Table 2).

OSP1 was at the lateral margin of the scapula when palpated in the volunteers. In the cadavers, OSP1 was located where the axillary nerve (nerve to teres minor)penetrates the teres minor (TeMi) muscle and innervates this muscle (Figure 11 and Table 2).

OSP2, the fleshy part of the triceps brachii, could be palpated in the volunteers. In the cadavers, OSP2 was seen between the

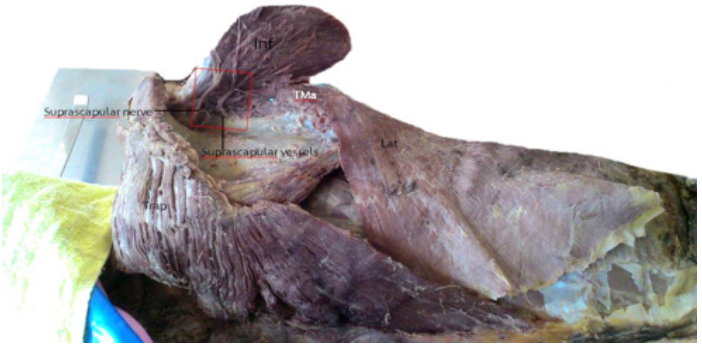

Figure 7 Deeper dissection of a right upper limb showing the suprascapular vessels with the nerve entering underneath the infraspinatus (Inf). Lat, latissimus dorsi; TMa, teres major; Trap, trapezius

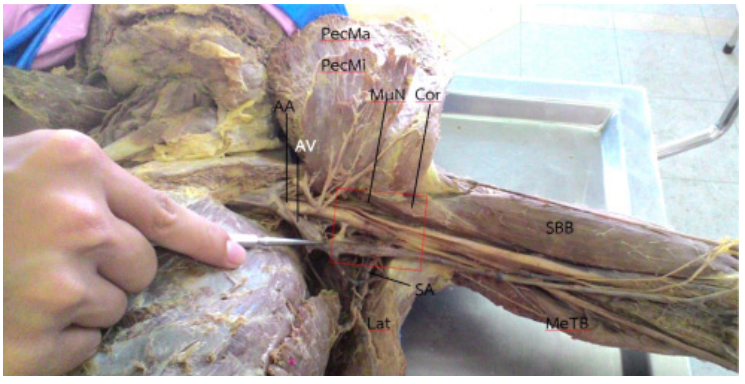

Figure 8 Deeper dissection of a left upper limb showing ISP1 located at the 3rd part of the axillary artery (AA), and the nerve descending below the pectoralis minor. AV, axillary vein; Cor, coracobrachialis; Lat, latissimus dorsi; MeTB, medial head of triceps brachii; MuN, musculocutaneous nerve; PecMa, pectoraris major; SA, subscapular artery; SBB, short head of biceps brachii

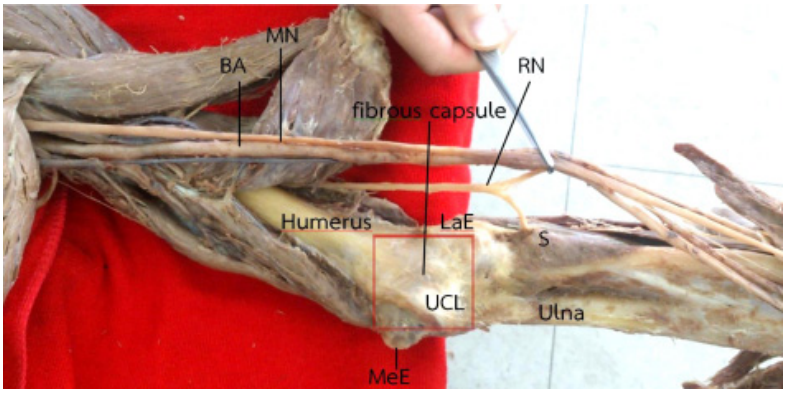

Figure 9 Deeper dissection of a left upper limb showing the location of ISP3 corresponding to the articular capsule of the elbow joint. BA, brachial artery; LaE, lateral epicondyle; MN, median nerve, RN; radial nerve; S, supinator; ULC, ulnar collateral ligament.

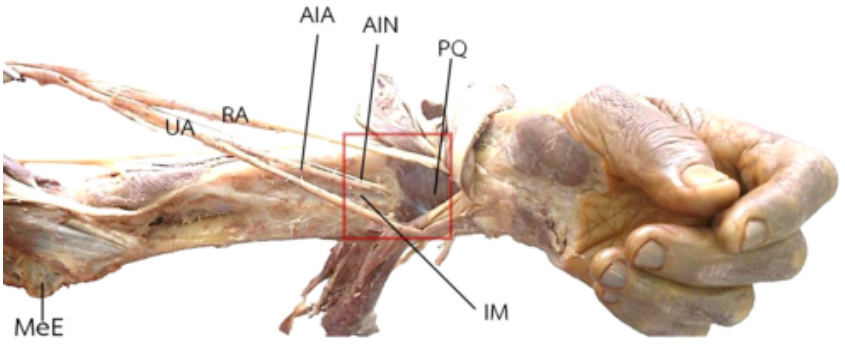

Figure 10 Deeper dissection of a left upper limb showing the location of ISP5 in relation to the anterior interosseous nerve (AIN), and where the anterior interosseous artery (AIA) is seen entering the muscle pronator quadratus (PQ) muscle. IM, interosseous membrane; MeE, medial epicondyle; RA, radial artery; UA, ulnar artery.

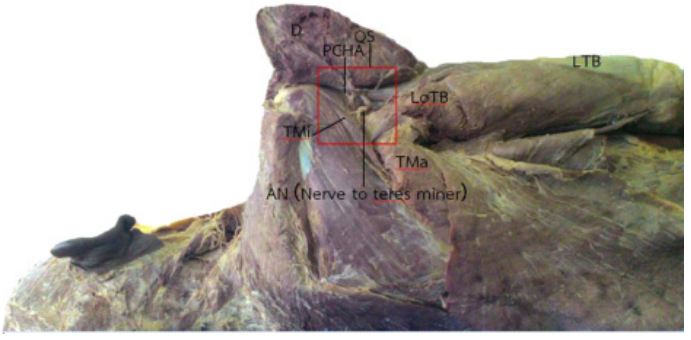

Figure 11 Deeper dissection of a right arm showing the location of OSP1 corresponding to the axillary nerve to teres minor. This was seen entering the teres minor (TMi) and supplying it. D, deltoid; LoTB, long head of triceps brachii, LTB; lateral head of triceps brachii; PCHA, posterior circumflex humeral artery; QS, quadrangular space; TMa, teres major; TMi, teres minor.

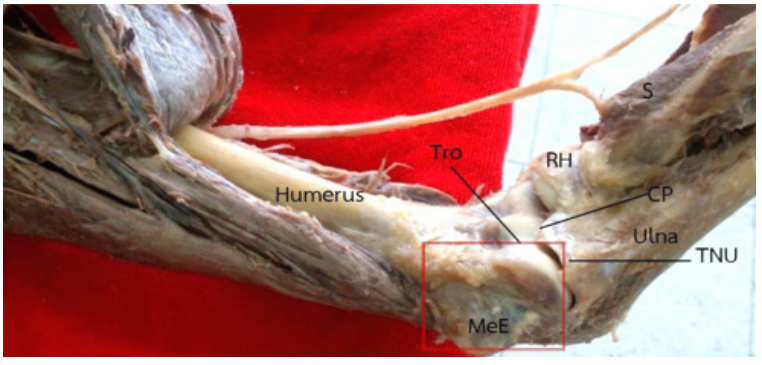

Figure 12 Deeper dissection of a left arm showing the location of OSP4 corresponding to the humeroulnar joint of the elbow. CP, coronoid process; MeE, medial epicondyle; RH, radial head; S, supinator; Tro, trochlear of humerus; TUN, trochlear notch of ulna.

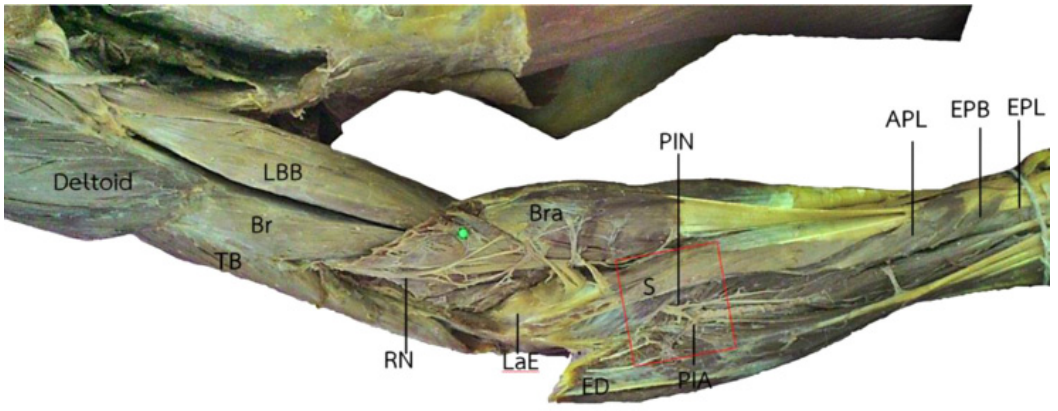

Figure 13 Deeper dissection of a right upper limb showed that OSP5 corresponds to the PIN with PIA emerging from the distal border of supinator (S). APL, abductor policis longus; Br, brachialis; Bra, brachioradialis; ED, extensor digitorum; EPL, extensor pollicis longus; LBB, long head of biceps brachii; RN, radial nerve; TB, triceps brachii.

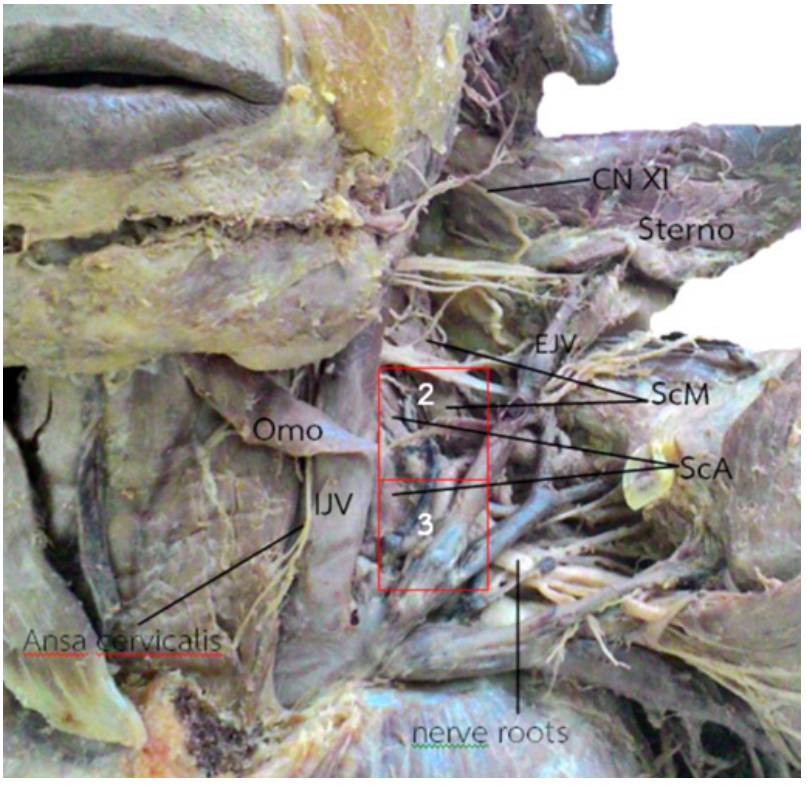

Figure 14 Deeper dissection of the left side of the neck showing the location of SSP2 (2) and SSP3 (3) in relation to the nerve roots from C5–C7 emerging between the scalenus anterior (ScA) and scalenus Medius (ScM) muscles. CN XI, accessory nerve; EJV, external jugular vein; IJV, internal jugular vein; Omo, Omohyoid muscle; Sterno, sternocleidomastoid muscle.

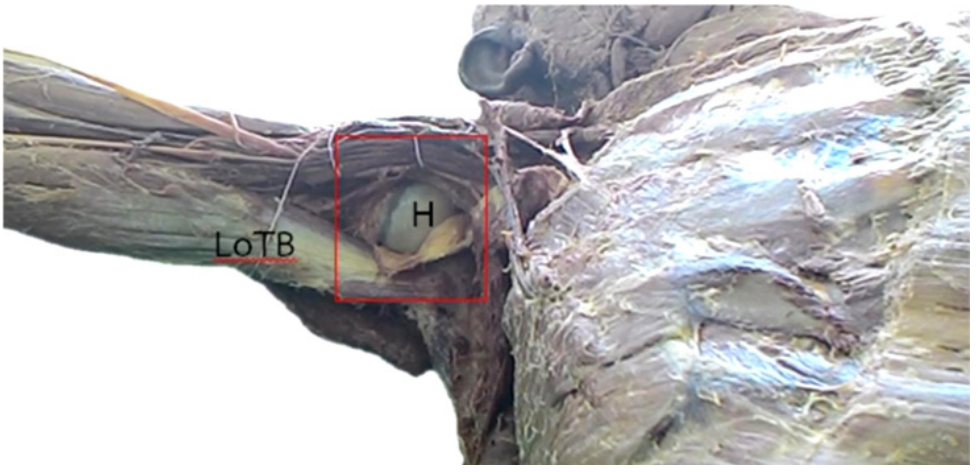

Figure 15 Deeper dissection of a right arm showing the location of SSP5 in relation to the fibrous capsule of the shoulder joint. This was found to overly the articular cartilage of the humeral head (H) in the glenoid fossa. LoTB, long head of tricepbs brachii.

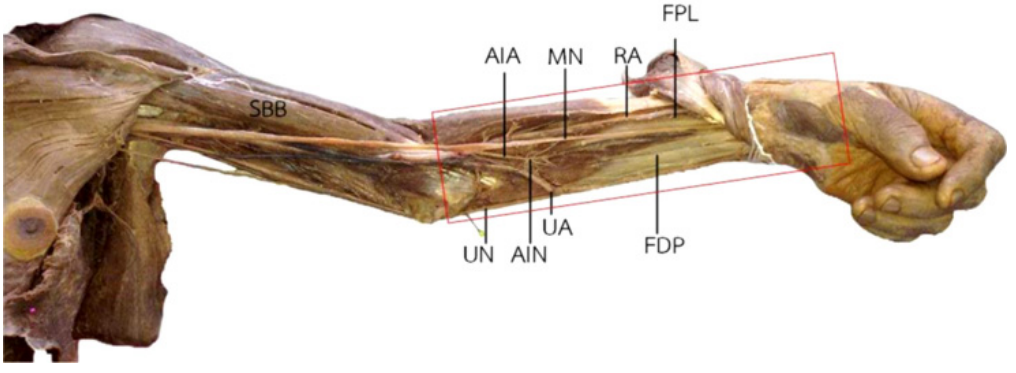

Figure 16 Deeper dissection of a left upper limb showing the location of the BLIF running along the MN and passing through the deep surface of the FDS. FDP, flexor digitorum profundus; FPL, flexor policis longus; RA, radial artery; SBB, short head of biceps brachii; UA, ulnar artery; UN, ulnar nerve.

lateral head of the triceps brachii (LaTB) and the long head of the triceps brachii (LoTB) muscles. On deeper dissection, radial nerve (RN) ramified to supply the LoTB and passed inferolaterally into the radial groove with the profunda brachii artery (PBA; Table 2).

The lateral epicondyle could be palpated adjacent to the OSP3 in the volunteers. In the cadavers, OSP3 was the origin of the extensor carpi radialis longus (ECRL) muscle, where the RN gave branches to innervate the surrounding muscles. Deeper dissection showed that the radial collateral ligament (RCL) of the elbow joint continued from the

lateral epicondyle to the annular ligament of radius and when dissected at the RCL, the humeroradial ligament of the elbow joint was found in the deepest layer (Table 2).

At OSP4 in the volunteers, the medial epicondyle could be palpated at the medial epicondyle of the humerus. In the cadavers, OSP4 corresponded to the origin of the humeral head of the pronator teres muscle. Deeper dissection showed the ulnar collateral ligament (UCL) radiates from the medial epicondyle to the base of the coronoid process of the ulna. When dissecting at the UCL, the humeroulnar ligament of the elbow joint was present (Figure 12).

In the volunteers, the fleshy part of the extensor digitorum (ED) muscle could be palpated at the point OSP5. This point could be confirmed by massaging, which led to extension of the middle finger. In the cadavers, OSP5 was located at the fleshy part of the ED where the RN ramified to supply the surrounding muscles. After dissecting deeper, the posterior interosseous nerve (PIN) and posterior interosseous artery (PIA) emerged from the distal border of the supinator muscle (Figure 13 and Table 2).

In the volunteers, SSP2 and SSP3 could be palpated at the posterior border of the sternocleidomastoid. In the cadavers, these points lined the platysma muscle. When this muscle was removed, SSP2 and SSP3 were situated on the posterior border of the sternocleidomastoid muscle and related to the occipital triangle where the cutaneous nerve from the cervical plexus emerges from the posterior border of the lower third of the sternocleidomastoid muscle. After dissecting deeper, the spinal accessory nerve pierced underneath the sternocleidomastoid muscle and innervated it. Deeper dissection showed that the nerves roots C5-C7 emerging between the scalenus anterior and scalenus medius muscles correspond to SSP2 and SSP3 (Figure 14 and Table 2).

In the volunteers, the subclavian arterial pulse could be palpated at SSP4. In the cadavers, SSP4 was located at the platysma muscle. When the muscle was dissected at this point, SSP4 corresponded to the subclavian triangle at a location adjacent to the superior border of the inferior belly of the omohyoid muscle. Deeper dissection showed the nerve trunks of the brachial plexus were under the inferior belly of the omohyoid muscle where the third part of the subclavian artery continued into the axilla through the outer border of the first rib. This was confirmed by pressing at SSP4, which led to a decrease in the radial arterial pulse (Table 2).

The axillary arterial pulse could be palpated in the volunteers at SSP5. In the cadavers, SSP5 was at the apex of the axillary fossa where the axillary vessels and the axil-

lary nerve of the brachial plexus penetrate through the outer border of the first rib to the axilla. When dissecting deeper, the fibrous capsule of the shoulder joint was found to overly the articular cartilage of the humeral head in the glenoid fossa (Figure 15 and Table 2).

The BLs

BLIF could be palpated at the line running lateral to Bra and medially to FCR and PL in the volunteers. In the cadavers, the BLIF ran between the lateral border of Bra and the medial border of FCR and PL at the superficial level. Deeper dissection at the neck of the radius in the cubital fossa showed BLIF was at the point of the brachial artery (BA) that divides into the radial and ulnar arteries. At the intermediate level, the MN and its branches pass through the deep surface of the FDS. Deeper dissection showed that the BLIF also corresponds to the AIA and the AIN which were seen under the FDP and descended in front of the IM (Figure 16 and Table 3).

BLOA runs along the longitudinal arrangement of the triceps brachii and could be palpated in the volunteers. In the cadavers, BLOA was seen between the LaTB and the LoTB by the fleshy parts to the tendons. When dissecting deeper at the proximal part of this line, RN was found to pass inferolaterally into the radial groove with the PBA. At the groove, RN gives off branches to the LoTB and the long slender branches then descend through the medial head of the triceps to the anconeus muscle (Table 3).

BLOF runs along the origin to the tendon of the ED and could be palpated in the volunteers. At a superficial level in the cadavers, BLOF could be mapped to the origin to the tendon of the ED, where the RN ramifies to supply the surrounding muscles. When dissecting deeper, the PIN with the PIA

Table 3. The BLIF, BLOA, BLOF and the structures correlation in the cadavers.

Lines	Muscles	Vessels	Nerves (N)
BLIF	muscular origins to the tendons of the anterior compartment of forearm	-brachial artery that divides into the radial and ulnar arteries (superficial level) -anterior interosseous (deep level)	- median (superficial level) - anterior interosseous (deep level)
BLOA	-triceps brachii	profunda brachii	radial
BLOF	-extensor digitorum (superficial level) -supinator (deep level)	-posterior interosseous	

emerges from the distal border of the supinator muscle and then descends behind the IM (Table 3).

Discussion

Anatomical structures were normal in the participants, and no differences were detected between participants of male and female.

The BLs of the upper limbs are found along the longitudinal arrangement of muscles from the origins to the tendons, and also the vessels and nerves supplying the muscles. This is a similar arrangement to the locations of BLs in the lower limb[7].

The points that are considered to be both massage points and SPs

In the upper limbs, the *Poed Pratu Lom* points (ISP2) correspond to the BA whereas the *Poed Pratu Lom* points in the lower limbs correspond to the femoral artery. Similar results are obtained if a *Poed Pratu Lom* point is pressed, this leading to a decrease in the radial and dorsalis pedis arterial pulse, respectively[7].

In the upper limbs ISP2 corresponds to the BA, while in the lower limbs ISP4 corresponds to the popliteal artery. Similar effects are obtained if ISP2 or ISP4 is pressed, this leading to a decrease in the radial and dorsalis pedis arterial pulse, respectively[7].

SSP1 in the upper limbs was the point where the suprascapular vessels and nerve enter the infraspinatus muscle, while the OSP2 in the lower limbs was the point where the superior gluteal vessels and nerve enter the tensor fascia latae muscle[7]. Massage at these points should be undertaken with care in patients because it may damage the arteries, nerves and lymph nodes.

Additional points present in the lower limbs were the OSP2 (hip joint), the ISP4 (knee joint) and the OSP3 (the penetrating point of the sciatic nerve to the inferior border of the piriformis muscle)[7]. Cadaver dissection indicated that comparable points were not present in the upper limb because the SPs in the upper limb did not correlate to joints or nerves.

The SPs

SPs present in the upper limbs such as OSP3 (humeroradial joint), OSP4 (humeroulnar joint), ISP3 (between humeroradial and humeroulnar joints) and SSP5 (glenohumeral joint). Cadaver dissection indicated that comparable points were not present in the lower limb because the SPs in the lower limb did not correlate to joints[7].

Vessels and nerves in the upper limb such as BA and MN at ISP3 or the AA at SSP5 moved down through the joints. Those structures were not present in the lower

limbs[6] because SPs in the lower limbs do not correspond to vessels or nerves.

The entering points of nerves in the muscles of the upper limbs were found at OSP1 (nerve to teres minor), OSP2 (RN), and ISP5 (AIA and AIN), a similar pattern to that observed with OSP4 (nerve to short head of biceps femoris) in the lower limbs[7].

Arteries were found at several points in the upper limb, namely ISP1 (AA), ISP3 (BA), ISP4 (RA and UA), SSP4 (subclavian) and SSP5 (AA), with these points running along the direction of the vessels. This was confirmed by pressing each of the points, this leading to a decrease of the radial arterial pulse. A similar effect had been noticed at ISP2 (femoral artery, FA), ISP3 (FA) and OSP5 (anterior tibial artery) in the lower limbs, with pressing at these points leading to a decrease in the posterior tibial and dorsalis pedis arterial pulse, respectively[4]. Massage at these points should be done with care in patients because it may damage the arteries, nerves and lymph nodes[7].

In the upper limbs, the points of the artery and nerve emerged from the distal border of muscles and gave branches to supply the surrounding muscles. This was found at OSP5 (PIN and PIA emerges from the muscle supinator). In the lower limbs, this pattern was not present because the SPs in the lower limb do not correspond to the points of the emerging nerve[7].

In the upper limbs, SSP2 and SSP3 correspond to the points of the 5th to 7th cervical spinal nerve roots located between the scalenus anterior and the scalenus medius muscles. This pattern was not found in the lower limbs[7].

All of the findings of this study parallel those of Chantawang and Somana, who found that CTTM SPs and BLs always relate to anatomical structures in the lower limbs[7].

Conclusion

This study revealed that upper limb SPs and BLs used in CTTM correspond to or are associated with various anatomical structures, especially nerves roots and nerves, blood vessels and muscles. This study focused on the upper limbs as therapeutic massage is frequently administered to these parts in a similar manner to the lower limbs. The results of this study support the practice of using hand(s) and thumb(s) to press on these points, SPs and BLs in CTTM. Information presented here should be valuable in establishing standard practice guidelines for CTTM.

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References

1. Center of Applied Thai Traditional Medicine. Thai therapeutic massage (Court type Thai traditional massage). Bangkok: Suphawanich publishing; 2003. (in Thai)
2. Center of Applied Thai Traditional Medicine. Thai traditional medicine in the Faculty of Medicine Siriraj Hospital. Bangkok: Suphawanich Publishing; 2009. (in Thai)
3. Dictionary of Medical and Pharmaceutical science, Royal Institute of Thailand. 2nd ed. Bangkok: The War Veterans Organization of Thailand Publishing; Massage, basic massage lines, signaling points, lom lam bong, lom phaiphat thakhat, lom praf; 2010. p. 223, 224, 254. (in Thai)
4. Center of Applied Thai Traditional Medicine. Thai therapeutic massage (The basic massage). Bangkok: Suphawanich publishing; 2011. (in Thai)
5. Center of Applied Thai Traditional Medicine. Thai therapeutic massage (The signaling points massage). Bangkok: Suphawanich publishing; 2014. (in Thai)
6. Patrakard P. The origin of *Sen Prathan Sib*. Journal of Thai Traditional & Alternative Medicine 2012;10(1):4-10. (in Thai)
7. Chantawang N, Mairuae N, Somana R. Anatomical Locations in the lower limb that correlate with the basic massage lines and signaling points of court type Thai traditional massage. Journal of Thai Traditional & Alternative Medicine. 2015;13(2):123-33. (in Thai)