

Word Anatomy

By Phillip Beach

Anatomy of the musculoskeletal system is a core subject in every massage course. This article explores an anatomy more appropriate to massage therapists' working mandate - whole living people.

When anatomy is studied, usually the names of the bones are learnt, then the muscles that run from bone to bone. Each muscle is described as having an origin coursing to an insertion, a nerve that issues from the spine to enliven that muscle, and the contractile action for that muscle is visualised.

This process is derived from a cadaveric approach to anatomy where a corpse is carefully surgically dismembered. The textbook pictures used in musculoskeletal anatomy study are in fact very difficult to tease out of a cadaver. It is a skilled and painstaking process to remove the surrounding tissue and leave only the appropriate bones and particular muscle. It takes many hours, even for an experienced dissectionist, to prepare a specimen for photography.

If I stand and turn to greet you I will have used about 600 named muscles. A complexly timed signal will course through my nervous system from the extrinsic muscles of my eyes to the intrinsic muscles of my feet. Likewise if I massage your back with long effleurage strokes I am affecting the numerous appendicular muscles of your limb girdles, the complexly segmented erector spinae group and the trilaminar body wall muscles. A single stroke can influence dozens of muscles.

The cadaveric approach to anatomy is absolutely essential when you have a surgical mandate. If you do not have a surgical mandate it is worthwhile thinking about how muscles act together in large functional groups.

In the world of osteopathy and physiotherapy there is a history of this attempt and it goes by the names of muscle chains, or muscle tracks, or biomechanical coupling patterns etc. As the musculature of the human body is so complex it is relatively easy to link different named muscles into larger functional groupings.

Muscles can be regionally linked as, for example, forearm flexors or internal rotators. Muscles can be linked by a similar fibre direction, as for example the internal oblique on one side to the external oblique on the other of the body. What this article will do is introduce a model of whole organism movement that uses the sciences of embryology and evolutionary developmental biology as its theoretical substrate.

History

To understand the present it is wise to understand the historical context. In this case the context is derived from understanding the evolution of vertebrates. How they first moved, how the aquatic propulsion system was adapted to terrestrial conditions, and how a tetrapod achieved bipedal locomotion.

Embryology is an allied context. It is also an intensely personal study as we all started as a fertilized spherical cell that divided to become a morula of cells. That cellular mass then flattened to become disc like, then folded in on itself to become a strangely shaped embryonic being with a huge brain, a massive pulsating heart, a stalk to mum, and a tail. At that stage an embryo has three distinct layers that are deeply and profoundly related:

- a) ectoderm, the outside layer, forms the nervous system and brain
- b) endoderm, the deepest layer, forms the gut tube from mouth to anus, and the organs that branch off that tube, e.g. lungs and liver
- c) mesoderm, a middle layer, forms muscles/bones, and interestingly blood and kidneys.

Contractile fields

I have used the evolutionary biology of vertebrates and human embryology to construct a model of movement that is very applicable to all manual therapists. I call this model 'contractile fields'. 'Contractile' because I did not want to be too tissue specific, every cell has an ability to change its shape.

Muscle is a specialised tissue the body uses to effect shape change. 'Fields' because we are not dealing here with links or chains, rather with a living biodynamic, interpenetrating pattern of fields. In short I propose the following:

- a) a ventro/dorsal field
- b) a lateral field
- c) an emergent helical field
- d) a radial field
- e) limbs that plug into and empower the Helical field (particularly in mammals), with a ventral and dorsal musculature.

A fish is a typical early vertebrate with a spine, a head end, a post-anal tail, paired fore and hind fins that will be co-opted for limbs later on. As it swims the fish bends its body side to side, a side-bending pattern of movement. Over millions of years this type of body was modified for terrestrial locomotion. On the land the spine needed to become more regionally specialised with cervical, thoracic, lumbar and sacral areas. Limbs to a large extent took over the job of propulsion.

All these challenges to the fish design lead to a new type of movement, that of flexing and extending the body. An example of this is the dolphin that was a four-legged animal that returned to the water about sixty million years ago, taking its new type of movement with it.

The dorsal component of this contractile field is obviously the erector spinae musculature. These muscles are derived from the epaxial muscles of fish. From the occiput to the sacrum, in a complex cascade, these muscles extend the spine. Laterally the field boundary is marked by the angle of the ribs and in the lumbar region by a fascial structure called the lateral raphe. However that is not the end of the dorsal story. Because of the folding of the embryonic disc the dorsal field is carried ventrally.

Pre-folding the heart is above the brain. Folding of the embryonic disc carries the precursor of the heart ventrally down into the chest region. Likewise caudal folding moves back muscles into the pelvic floor and low abdomen.

Imagine you are being pulled backwards by a nasty character who has you by the nose. No matter how strong you are, you will extend your spine. Likewise if this nasty character pulls you backwards by the upper lip you will bend backwards. These tissues are just too sensitive to risk damaging. But if that grip moves just a little further inferiorly to the upper teeth that nasty character will lose his/her fingers as you bite down with all the force of your neck and abdominal musculature. Here we have a field transition from extensor to flexor.

At the caudal end of your body, embryonic folding will drag dorsal musculature to the lower abdominal wall. Your lower abs are in fact back muscles, evidenced by the fact that if the caudal folding is disrupted you will be born with an exposed bladder. So the dorsal field is a bilateral, para-axial field of contractility that spans nose to lower abdomen.

The ventral component is the rectus abdominus from just below the umbilicus to the costal region of the thorax. The musculature between the end of the ribs and the sternum has its own nerve supply (the terminal branch of the intercostals nerve) and has been described as a separate entity to the rest of the intercostals musculature. Here it is called the parasternal-interchondral muscles.

Tetrapods then extend this musculature to the infra and supra hyoid musculature of the throat (only those muscles that insert to the middle third of the hyoid bone), and then onto the tongue and the muscles that close the jaw (innervated by the facial nerve).

The dorso/ventral contractile field is complete. You cannot extend without the flexors paying out, and vice-versa. I place the nose in this field as this sense organ embryologically starts as a separate left and right nasal pit. All vertebrate place the nose as the leading, rostral organ of the sensory platform.

So when massaging a client's back allow your hands to work the middle third of the back of the head, towards the eyes. With the patient supine, palpate the tissue lateral to the mid-line, both in the abdomen, thorax and face, is all in the same ventral field. In this way of thinking about anatomy facial massage has a profound effect on the whole body as in a real sense we are built around our face (and hands, feet and genitals).

Subsequent articles will develop the contractile field model into lateral and helical domains.

Phillip Beach (DO, NZRO. D.Ac) is an Australian national who began his study in 1979 at the British College of Naturopathy & Osteopathy in London. He is in private practice and taught osteopathic technique at the BCNO and the British School of Osteopath. For many years he taught sports massage at the Clare Maxwell Hudson School of Massage in London. In 1991 he graduated from the London School of Acupuncture & Traditional Chinese Medicine.

He is currently living in Wellington, NZ.

Phillip Beach is planning a lecture seminar on the subject discussed in this article in early 2005.