

Tissue planes and the Art of Dissection

Lord Moynihan

- He regarded his hands as the handsome servants of his controlling brain
- Infinite gentleness, scrupulous care, light handling and purposeful, effective, quiet movements which are no more than a caress, are all necessary if an operation is to be the work of an artist and not merely of a hewer of flesh
- A surgeon must have 'the heart of a lion and the hands of a lady'



Lord Moynihan summed up the art of dissection – infinite gentleness, scrupulous care, light tissue handling and purposeful, effective, quiet movement which are no more than a caress, are all necessary if an operation is to be the work of an artist and not merely of a hewer of flesh.

He was born in Malta in 1865 and returned to the UK with his mother after the death of his father. He trained at the Royal Naval college with the intent of following his father but went to medical school in Leeds and stayed on to demonstrate in anatomy. In the great war he reached the rank of Major – General.

He worked with McGill and Mayo-Robson. He became an attending surgeon at Leeds General Infirmary, then a consultant and finally a Professor of Surgery in 1925. He later became President of the Royal College of Surgeons of England from 1926 to 1932. He started the Annals of Surgery.

He was knighted in 1912, CB in 1917 and KCMG in 1918. He was made Baron of Leeds in 1929 and the second surgeon after Lister to be elevated to a peerage. He won every prize there was to win in surgery and dedicated his life to getting surgeons to work together and share knowledge. By all accounts he was less than a modest man and this is exemplified in his request to have his hands casts in bronze. He wanted to demonstrate that London was not the only centre for surgical excellence. He was the first to perform a blood transfusion in 1906. He was known for his ritual of hand washing and in 1912 was the first to introduce the green surgical drape.

There is a blue plaque on the wall of the building where he had his office on Park Square in Leeds and his bust adorns the stop of the grand stair case at the end of the hall of the Leeds General Infirmary on Great George Street in Leeds.

Embryology and tissue layers

The embryonic disc consists of the ectoderm, mesoderm, and endoderm. All connective tissue develops from the embryonic mesoderm and consists of collagen or elastic fibres, fibroblasts, fatty cells, etc., within a jelly-like matrix. It supports organs, fills the spaces between them. It also gives rise to the endocrine glands, heart muscle, kidneys, and the urogenital system. The mesenchyme also gives rise to cartilage bone and hematopoietic cells. The splanchnic mesoderm gives rise to the blood vessels that supply the organs developing from the endoderm (gut, liver, pancreas, and respiratory system). The neural system and peripheral nerves arise from the ectoderm and likewise pass through the mesoderm and thus are often found in the tissue planes. Nerves are easily identified the fact that they are white discreet cords.

It is all folding, branching, and twisting during embryonic development that gives rise to the surgical planes of dissection. These are usually bloodless except around all our endocrine glands. These organs have a large and varied venous drainage by view of their function. The veins are thin walled and do not diathermy. They require meticulous dissection and ligation.

Surgery is best affected by and understanding of the surgical planes of dissection. For example, how many people recognise Scarpa Fascia when opening an abdomen or chest - Scarpa fascia is a membranous layer of superficial fascia that extends over the lower thoracic and anterior abdominal wall, anterior to the midaxillary lines. Here, fibrous septa of subcutaneous tissue are condensed beneath the fat into a thin but strong membrane. All our muscles are defined and separated by connective tissue. In fact, every area of the body can be described from a surgical perspective in terms of layers. They serve the surgeon well and it is well to become familiar with the plane. These are seldom taught but do ask and enquire when you next watch an operation because this knowledge is tacit for the expert surgeon.

Dissection not only follows planes it also follows the arterial supply. Blood vessels developing from the splanchnic mesenchyme invaginate into the developing organs of the endoderm and the ectoderm. They carry with them parietal and visceral layers. The principle of dissecting out the segment of the lung for segmentectomy (the basis of modern lung cancer surgery), for example, is to follow the pulmonary artery from its origin to the segment by dissecting along these planes – the bronchi follow the arteries.

The long saphenous vein sits in a fascial layer – clean harvesting of the vein requires sharp dissecting of the fascia and the other layer immediately on top of the vein. This has to be done with the lightest of touches as it is well documented that rough handling of the vein during harvesting damages the endothelium of the vein and compromises the longevity of the vein as a conduit for coronary artery bypass grafts and reconstruction of the lower limb blood supply.

All veins and arteries have these layers – confident and careful dissection exposes these planes and enables the accurate ligation securing or clamping of the vessels – this is necessary for access and surgery to the femoral vein and artery and all of vascular surgery.

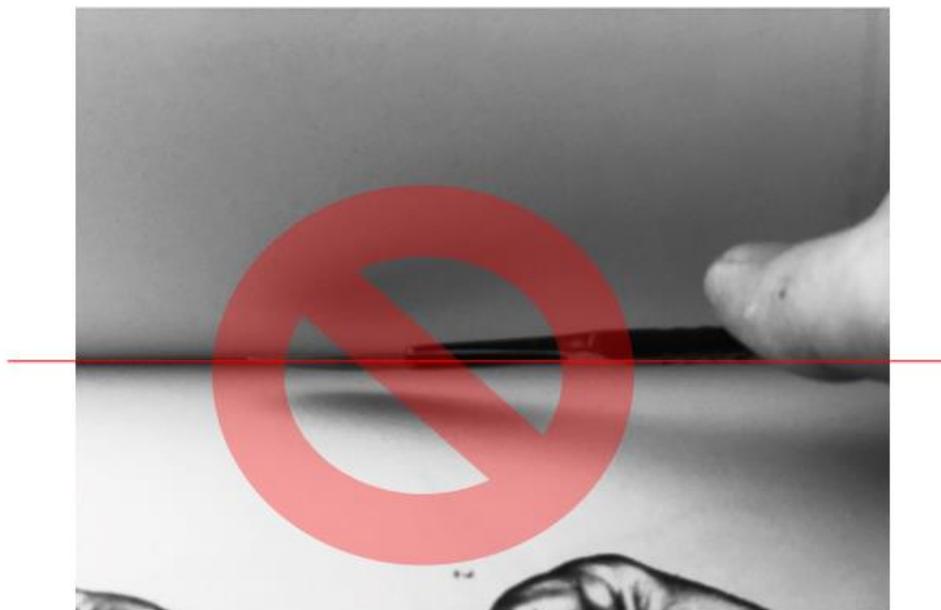
Handling and alignment of the blade

The handling of the knife is much the same as when making an incision only this time the grip is lightened. The handle is not pressed into the palm of the hand as needed to apply downward pressure (the weight of the forearm) for an incision, if anything it has come away from the palm but

the index finger is still stabilising the blade down the shaft and the blade is still held between the pulp of the thumb and the lateral aspect of the terminal phalanx of the middle finger. The scalpel is lightly held in the palm of the hand.

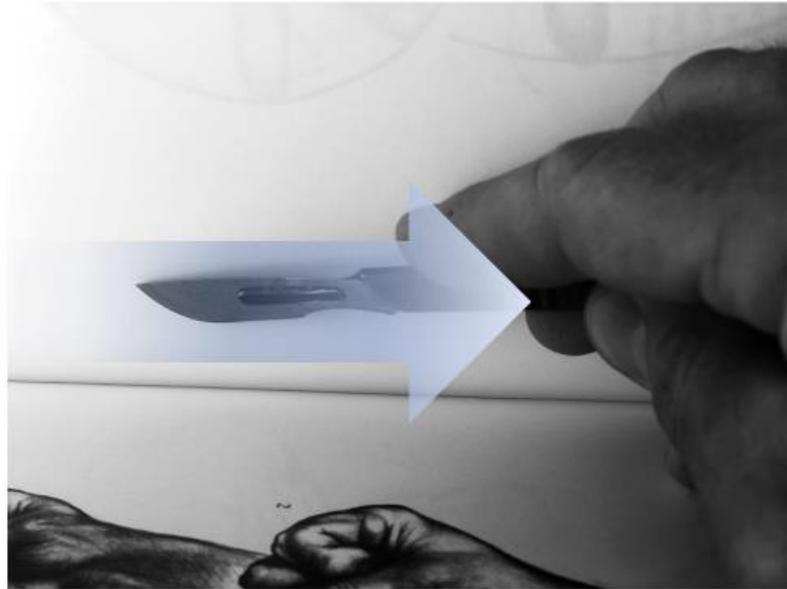


The blade should not cut into the tissue plane as this will inadvertently cause damage to both surfaces of the tissue plane



The blade should be aligned parallel to the surface of the tissue plane that is being dissected away. The blade is drawn across and away from the surgeon with the lightest of touch as if 'brushing' the surface of the tissue. This action is the 'caressing' of the blade against the tissue eluded to by Lord

Moynihan. Gentle 'brush strokes' along the plane of dissection is the work of an artist. The blade is brushed over the length in the same way you would use a brush to apply a thin layer of paint



The tissue plane parts with each brush stroke of the knife without damage either layer. Pause, if there is resistance, be mindful of the anatomy and beware of neurovascular bundles that insinuate themselves between these planes during embryological development.

Traction and counter traction

The method of dissection is dependent on appropriate traction and counter traction. This is applied with the gentle and judicious use of the forceps by the surgeon and the assistant. Remember that forceps can crush tissue; be careful with placement of the forceps and the amount of force applied. Longer planes of dissection can be maintained by holding the tissue gently in the hand with a swab but that leaves the surgeon one handed. It is better to ask the assistant to use two forceps to hold lengths of tissue. The surgeon can apply counter traction over such a length using a swab pressed down with the weight of the forearm. Traction is maintained throughout as the plane develops. The forceps of the surgeon and the assistant must be repeatedly reapplied as the dissection develops to maintain traction and counter traction.

In the case of redo surgery in the chest or the abdomen or anywhere for that matter, the tissue planes are obliterated by fibrotic scar tissue. These adhesions are so dense that they must be cut deliberately – scissors are best used for this method of dissection. They are used to 'persistently-nibble, over a wide area. The tips of the scissors themselves are sharp and can stab and injure underlying soft tissues – the points of the scissors are gently insinuated into the plane and gently opened and removed before closing – never close the tips of the scissors blind as the scissors may end up cutting something. Keep the tip and belly of the scissors in the same line of vision as previously described. Remember that adhesions often have a very high tensile strength and will not tear; any sweeping motion with the hands or scissors to develop the plane will tear the underlying tissue, unless done with the lightest of touch and the only applied to the thinnest of tissue – the lung will tear easily and leave a large air leak, the liver will tear and bleed and it is very easy to strip the epicardium and the blood vessels off the heart before entering the ventricle.

Adhesions are white and fibrous and, in that regard, may look like nerves – it is important to know your anatomy and be wary that previous interventions may have distorted the anatomy. It is best to work over a wide area in redo dissection; if one area proves awkward or presents uncertain anatomy, develop the dissections either side. A good assistant helps but part of learning the craft of surgery is learning how to deploy the skills of your assistant. This will be covered in another lesson.

Good dissection is an art and can only be practiced when you understand the science. Patience and persistence are required with a lightness of touch and proper use of the knife, scissors, and forceps. Be careful in the smallest of matters and think about the ‘feel’ of the blade and the scissors. It is the lightness of touch that affords the necessary proprioception and feel of the tissues. The way the instruments are held will determine if the difference between a ‘hewer of flesh’ and a work of art.

