

The Scalpel

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The word scalpel is derived from the Latin 'scalpellum' to mean blade. It is not surprising that blades were popularised by the Romans as they had a formidable army that conquered the then known world. The gladiators were well versed in the use of the blade – strikes, blocks, and regions of the body. Most the strikes were aimed at the junction of the limb and the trunk because the major vessels and nerves are 'bundled' together in a relatively small space (groin, axilla, and neck) as they leave the trunk to the head or limbs.

The finest blades are arguably recognised as the Japanese Katana – the workmanship, balance and function of the blade has stood the test of time. The art of the sword is practiced worldwide in the form of laido. The art of drawing the sword and executing strikes is prescribed and described. It has been handed down from generation to generation. The scholar needs to be at one with the sword. The posture, breathing, mental state and haptics of sword movement are all taught in the art.

By contrast the use of the scalpel is poorly explained. The skills are tacit for more expert surgeons but few (only one person in my fifteen years of training) has detailed the haptics and use of the scalpel. This is an attempt to condense those principles into written word to supplement the live broadcasts.

History

The blade has been used since Mesolithic times and Hippocrates described a 'macairon'. It was in 1910 that a doctor in Chicago, John Murphy, is attributed as 'inventing' the surgical scalpel. But it was a twenty-two-year-old Morgan Parker who invented the two-piece blade and handle and described the ideal way to join the two. In 1915 the Bard-Parker company was established, and they patented the scalpel. The blades were inspired by the disposable razor blades used by King Gillette.

In 1932 Swann-Morton and Miss D Fairweather were selling razor blades and they entered the scalpel market in 1935 when the patent ran out. The chairman Swann outlined a very progressive philosophy for the company that is very applicable today. As I believe teaching, managing, and parenting share the same skills – I will share a summary with you:

- The company is built on labour delivered by Human Beings.
- If the company cannot pay for that labour, a new policy is required.
- If the management cannot deliver that policy, then new management is required.
- The individual employee can demand that these objectives are met.

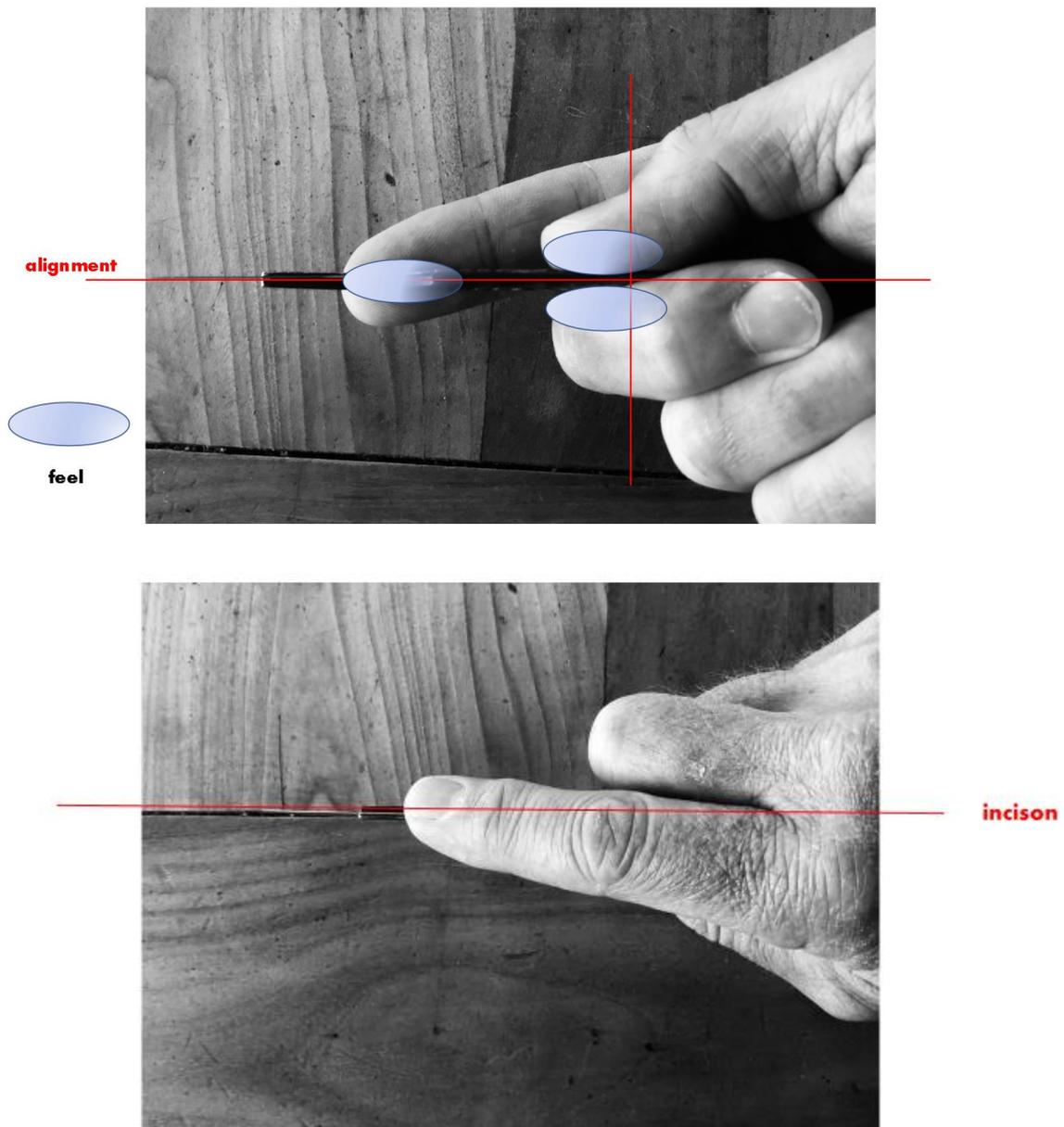
Indeed, half the company is held in a trust and the other half is owned by the workers. In education we need to value and grow the skills of the individual learner.

By 1957 Swann and Morton were making 38 million blades a year – it is not surprising they are based in Sheffield, the heartland of the British steel industry. You may notice this is stipulated on your knife and fork that you may use at home. In the 1960's with the help of the UK atomic energy agency, they established a world leading onsite Cobalt gamma radiation sterilisation plant that still operates today. Today they manufacture 1.5 million blades a day (70 different varieties) and they are exported to over 100 countries.

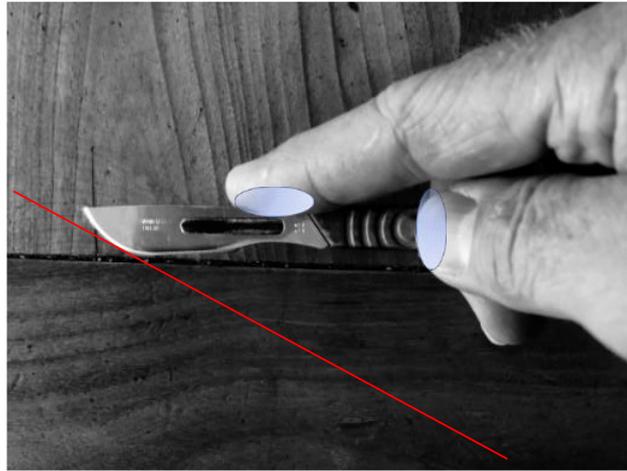
I am delighted that they sponsor the Silver Scalpel Award that I established in 2009 to recognise the best surgical trainer of the UK. The Silver-plated scalpel is mounted in an acrylic block on an oak plinth. A fine trophy for the skilled teacher that includes the most important tool in the surgeon repertoire.

The scalpel

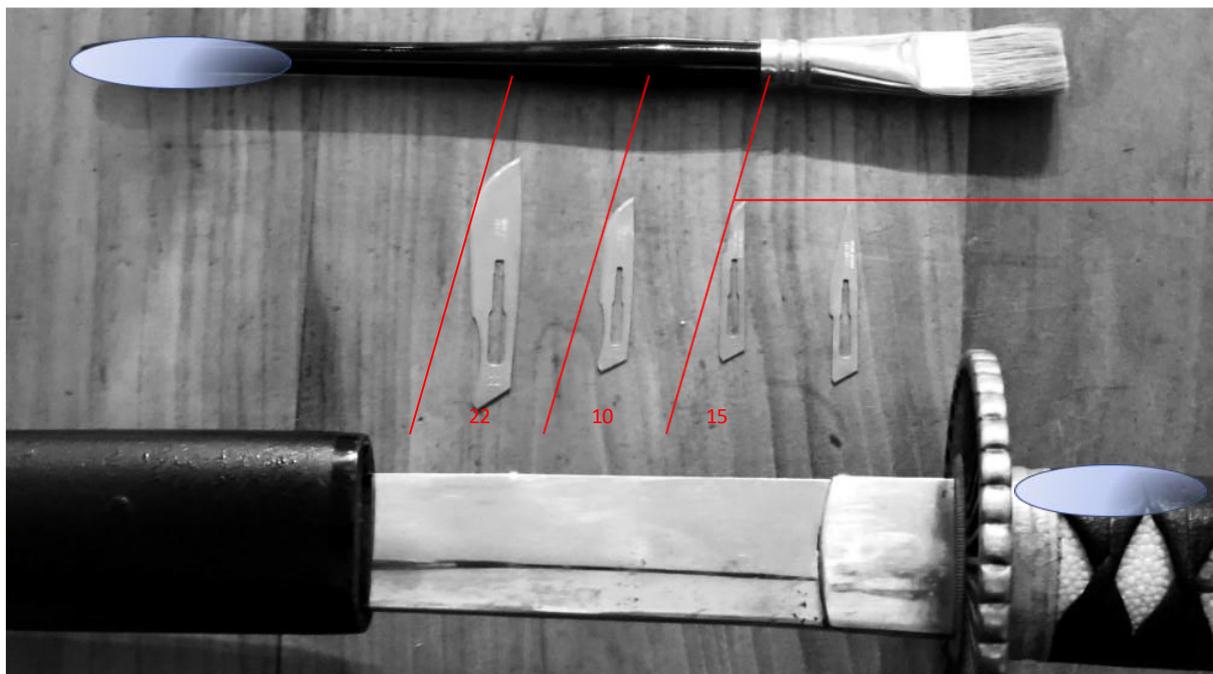
The design of the scalpel is such to maximise the feel, balance, and necessary rigidity to make an incision. It is important to hold the scalpel like a knife. The index finger is extended down the blade and the handle is held perpendicularly between the pulp of the thumb and the side of the terminal phalanx of the middle finger. The heel of the handle sits within the palm of the hand. The index finger helps judge the pressure and reinforces the direction and the thumb and middle fingers always maintain the blade at ninety degrees to the tissue.



The cut is made with the belly of the blade and hence the angle to the tissue is approximately 45 degrees. It is important to support and stretch the skin with your non-dominant hand while making the incision between your index finger and thumb.



The working edge of the blade is the belly- this applies whether the blade is large e.g., 22, medium e.g. 10 or a 15. The 11 blade is used for 'stabbing' – incision for drains or the aortotomy for bypass cannulation. The depth of the 'stab' is controlled by a finger gently placed against the side of the blade. The blade handles are adjusted for the size of the blade – number 4 handle for a 22 blade and a number 3 handle for 10, 15, and 11 sizes. There are many other blades for fine dissection. The Barron blade holder has a hexagonal shaft like a pencil and be held as such for fine dissection.



For skin incisions it is important to use the whole length of the incision. I recall my early days operating and finding myself struggling and calling the consultant in to help - all they extended the incision to improve access. Remember wounds heal from side to side and not end to end. Furthermore, prolonged retraction on a small skin wound will result in ischaemia of the skin at either end of the wound as the retractors are opened wider and wider to improve access. This applies to laparoscopic surgery and incisions for drain as well. Too often the end wound ischaemia exacerbates scarring, and the result looks like a bullet wound and ruins the aesthetic of the main incision.

It is important to keep the blade perpendicular to the skin through the incisions. This is important when describing a fusiform excision of a skin lesion. A properly designed fusiform excision has a length-to-width ratio of 3 to 1 and produces a 30-degree angulation at both edges of the wound.

The skin

Most often we get to the interior of the body by making an incision through the skin – endoscopic access has been proposed and trialled. The cut through the skin needs to be complete i.e., through all the layers. This will then leave two clean edges that are perpendicularly cut that will enable and promote the best healing by primary intention, provided the edges are gently apposed and slightly everted and not strangulated by the sutures.

Often, the trainee is hesitant to use the blade for fear of damaging the deeper tissues; they then scratch through each layer, and I have observed dissecting scissors used to tear the tissue apart. This essentially macerates the tissue and will impair healing. It is important to learn how to feel the depth of the cut. We would commend that you practice on various organic materials, for example ripe fruit and oranges etc. The aim is to incise the skin only and not cut the flesh underneath.

Langer's lines

Karl Langer, (15 April 1819, Vienna – December 1887) was an Austrian anatomist. He is known for his work in the field of topographical anatomy. He studied medicine at the Universities of Vienna and Prague. He noticed that when he inflicted ice pick wounds on fresh cadavers that some of the wounds remained round, as in the point of the pick, whereas others, on removal of the ice pick, assumed an ellipsoid shape. He further noticed that in some areas of the body the skin was stretch and in other areas it was taught. He spent several years investigating this observation by making 'Swiss cheese' of cadavers. With this information he mapped out 'Langer's lines' that have guided surgical incisions ever since and significantly improved wound healing and reduced long agonising post-operative recoveries.

Layers of the skin

Epidermis

- Stratum basale
 - Columnar cells dividing and pushing the new cells to the surface.
 - Contains melanocytes that give the skin pigmentation.
- Stratum spinosum
 - The keratinocytes are developing in this layer.
 - This is the thickest layer.
 - Contains the Merkel cells.
 - Contains Langerhans cells named after Paul Langerhans who described them as a 21-year student. They were first believed to be part of the nervous system, but we know that they are the first line of defence against infections in the body. They are also

found in the respiratory tract, gastrointestinal system, urogenital tract, and lymph nodes.

- Stratum granulosum
 - The cells here contain dense basophilic keratohyalin granules.
 - This gives the skin with a waterproof barrier.
 - Water cannot get in and it reduces water loss.
- Stratum lucidum
 - This is found primarily on soles of the foot and the palm.
 - It is full of a thick protein eleidin.
 - This gives the skin its crucial stretchy ability in these areas.
- Stratum Corneum
 - This is colloquially called the brick wall or pavement.
 - This is a layer of keratinised cells.
 - This protects against bacteria and UV light.

Dermis

- This contains nerve endings, sweat glands and hair follicles.

Subcuticular tissue

- Fat
- Connective tissue
- Larger vessels especially veins (these will not diathermy as they have thin walls – please ligate them)

It is possible to cut through all these layers with one clean cut. Indeed, I do this for a midline sternotomy i.e. I use the knife all the way to the sternum and avoid the use of cutting diathermy. This has been shown to reduce the incidence of wound infection. My median all wound problem for the last 1770 cardiac cases is zero.

There is a simple message: **SHARP DISSECTION IS CLEAN DISSECTION**