

# The Needle

David J. O'Regan

Most of us are familiar with threading a needle to sew on a button but do we know the background of the needles used in theatre. Why are they the shape they are? How can we use them better? What are the essential elements of needle control?

## History

Bone needles of 47000 years (Aurignacian Era) have been found in caves in Slovakia. These were used to pierce animal skins to thread them into garments. The Egyptians were adept at using needles and needles are described in Sanskrit texts. The bronze and iron saw the advent of metal needle of the same shape. They were made by the blacksmiths and although they were crude in the modern sense, they were used for tapestries like the Bayeux Tapestry that depicted the Norman conquest of Britain in 1077. In the Middle Ages the City of Nuremberg became the centre of this art as they could access material from Italy and make needles because of their renowned ability to make armour.

In the nineteenth century needle were in 'mass production' but it was very labour-intensive and using women and children. They were made from straightened wire, forged, and fattened for the eye, and ground for the point. They then needed hardening and quenching by placing them in a furnace and dropping them in oil. This left them dirty, and they had to be polished – the average 'common' needles were scoured for a day, but the 'bright' needles took a week.

When did the needle become curved in shape and why? Medical texts of the ancient Vedas and sacred Hindu texts first written about 3,500 years ago, prescribe straight and curved high-quality steel needles. In the science museum there is a packet of 12 Hagedorn needles, straight and curved, by Mayer and Meltzer, London dating from 1905.

George Merson, a Scotsman, removed the eye of the needle in the 1920's and attached the suture directly to the needle by embedding it in the end – the swage was formed. He and his wife were making artificial catgut in their kitchen. George Merson was born in Aberdeenshire and trained as a pharmacist. In recognition of his important scientific advances, he was elected a Fellow of the Royal Society of Edinburgh.

In 1947, his company, Merson and Co, was bought by none other than Johnson & Johnson. The new company was named Ethicon Suture Laboratories and was situated in Sighthill, a suburb of Edinburgh. It was registered as Ethicon Inc. in 1953 and began as a factory that manufactured, packaged, and sterilized catgut, silk, and nylon sutures. They are now an oligopolistic company with their headquarters in Cincinnati, USA and a large manufacturing plant in Hamburg, Germany. George Merson continued his interest in Ethicon by inviting the directors of Ethicon, once a year, to dinner at the Conservative Club in Edinburgh, until his death in 1958. He is buried in Dean cemetery in Edinburgh.

The adoption of the curved needle in surgery is a consequence of a realisation that a curved needle was easier to manipulate in the close confines of the dissected or body cavity. Needles are now made of alloys of Nickel, Steel and Titanium. Ethicon asked me to try a 'kryptonite' needle on one occasion.

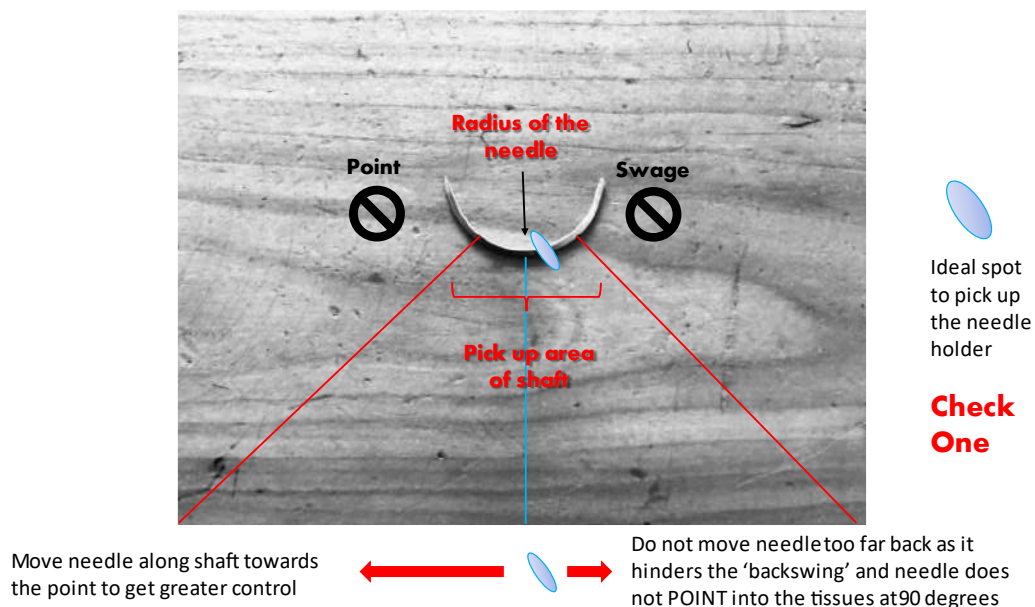
## Geometry and shape

All curved needles are geometrically made on the circumference of a circle. This dictates how it should be used. Likewise, all needles have a similar anatomy – the point, the shaft, and the swage. This again dictates how the needle should be picked up. This applies to ALL needles no matter their size.

- The Point has three forms: **Do not handle with needle holder.**
  - Blunt – atraumatic needles for passing through solid organs.
  - Round sharp point - bowel.
  - Cutting (number of different bevels e.g., taper) – calcified atheromatous vessels
- The Shaft:
  - This is the working part of the needle.
  - It is slightly cuboidal to assist needle pick up – a gentle grasp enables the needle to settle into position.
- The Swage: **Do not handle with needle holder.**
  - This is the widest part of the needle.
  - Manufacturers are reducing this in size – e.g., Everpoint by Ethicon

### Three checks to correct needle mounting

**Check one – mounted at the tip and correct part of the shaft mindful of use**

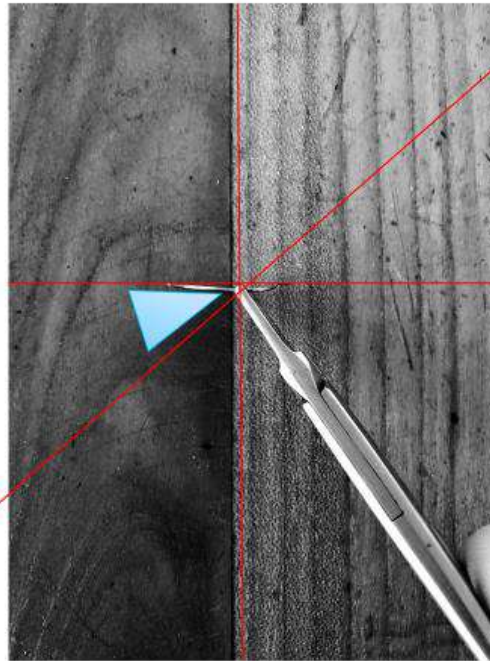


**Check Two – there is no space between the needle holder and the shaft of the needle – feel it with the pulp of the finger.**



### Check Three

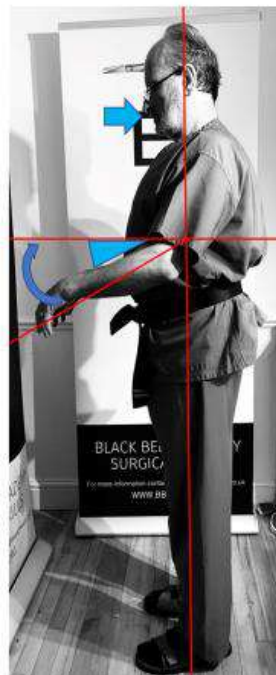
The needle is angled out – this is the same for forehand and backhand – this is related to the forearm to the horizontal!



### Check Two

There is no space between the needle holder and the shaft of the needle – feel it!

Check three – the needle is angled out forehand or backhand according to the angle between the horizontal and the forearm that is dictated by your posture, the relative height difference between the wrist and the elbow.

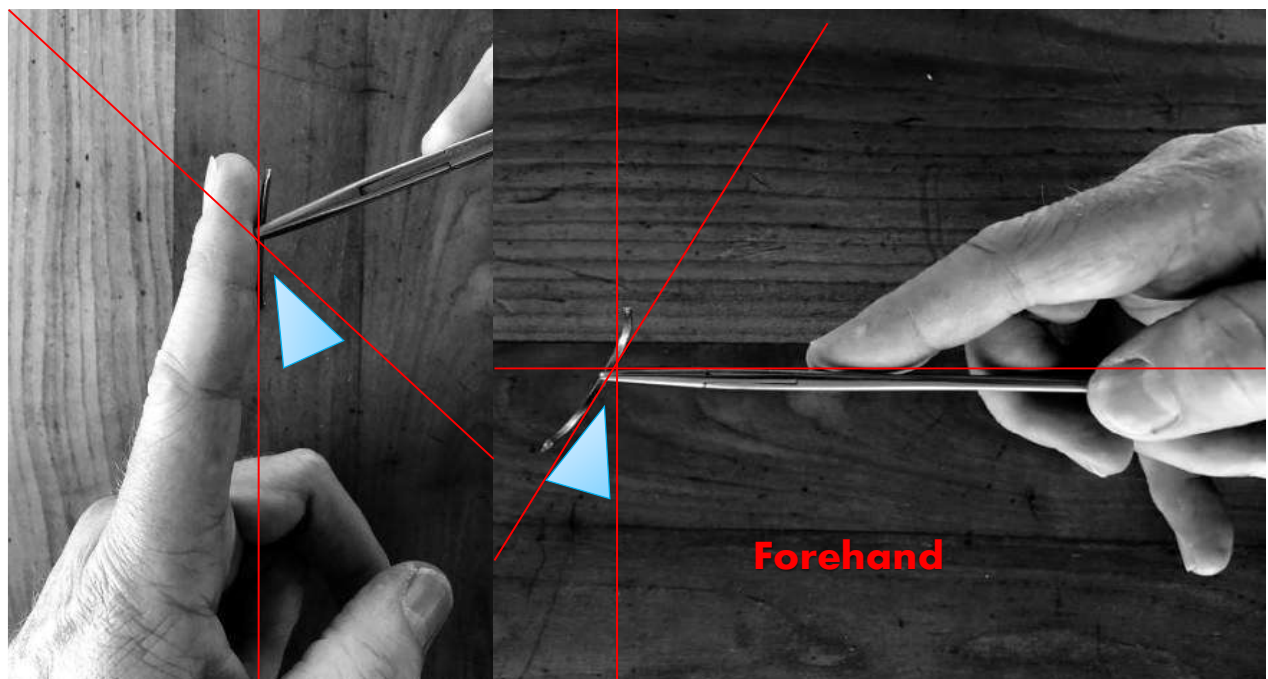


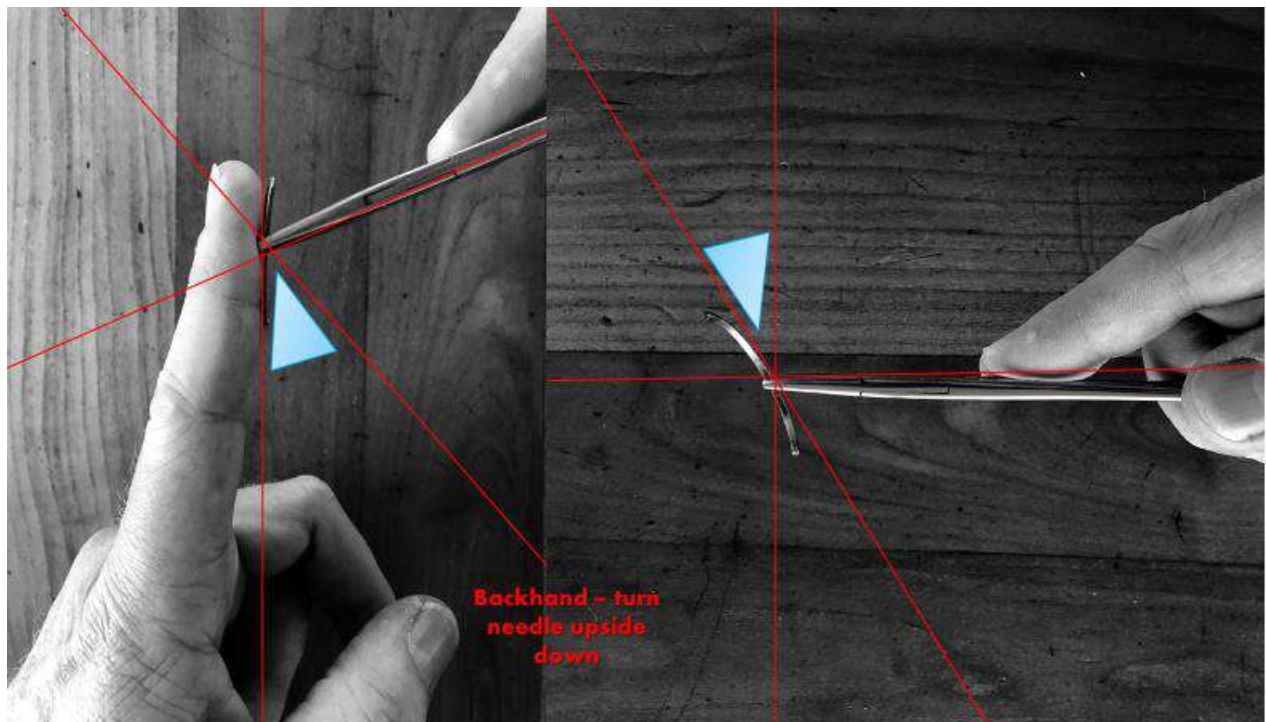
**These three checks must be done before each and every stitch to ensure perfect rotation of the needle!**

The focus of the trainee is understandably on the action to take the needle through the tissues – **SYSTOLE**. However, the rotation of the needle is compromised if the setup of the needle i.e., these three checks are not completed before the stitch. This set up is not described but is crucial to smooth stitching. This is **DIASTOLE** – if this is practiced and rehearsed then stitching becomes unconsciously competent and all wasted movement is removed. To the observer, the surgeon will have an established flow and with that flow they will be able to establish a rhythm. Once you understand your rhythm, you will realise your pace. The pace will enable the surgeon to use the natural pause in the operation to attend to things like haemostasis and guide the planning of the surgical list. At no stage in this description is SPEED mentioned. Good surgery is slow and deliberate without any wasted movement. That can only be attained by focusing on the setup. Golf professionals know this to be a crucial element to their game.

## Needle mount

The pickup of the needle is crucial. The suture packet or the pulp of the finger enable the correct position. To mount the needle backwards and at an angle, just turn the packet or the needle upside down. Generally, hold the packet or place the needle on the pulp of the index finger to maintain a ninety-degree orthogonal plane. If mounted and angled correctly, the 'belly' of shaft of the needle should bounce easily and cleanly on the surface of the tissue to be stitched.





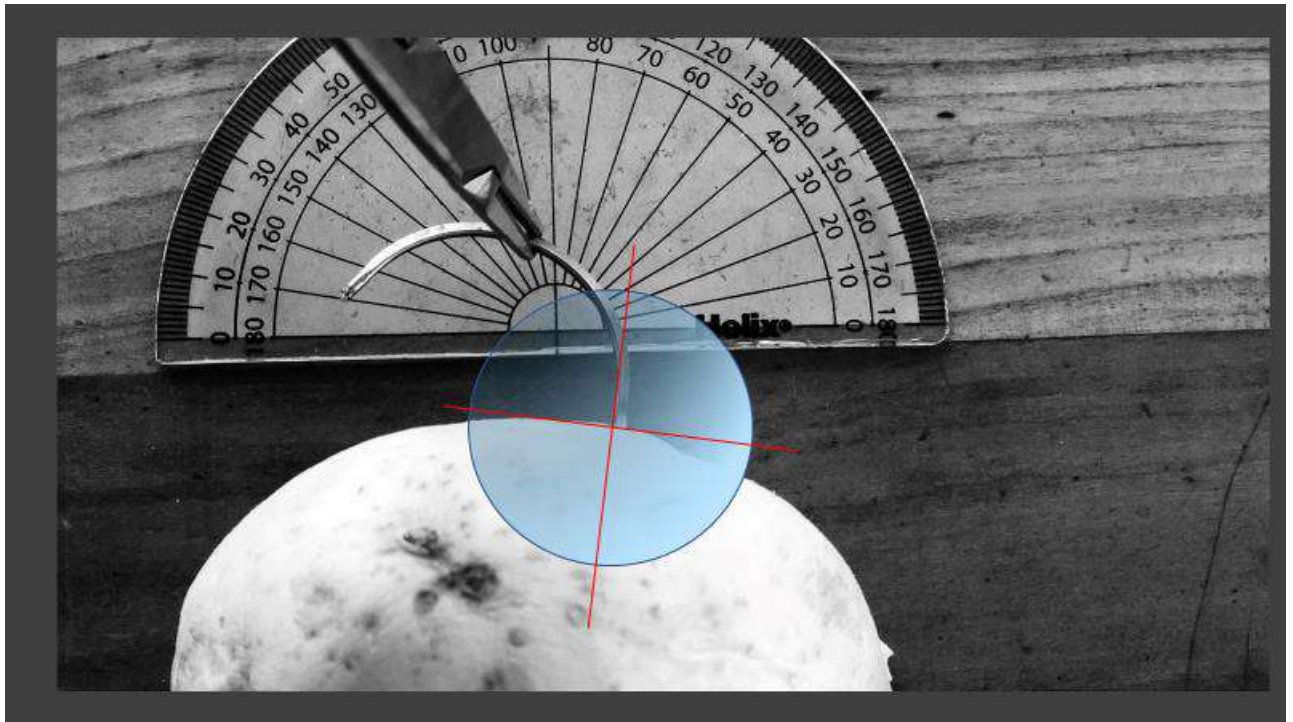
## The circle

All needles, no matter their size, are made on a circle – except J shaped needles that look like fishhooks. The smaller the size, the smaller the gauge and usually the less of the circumference is described. The commonly used needles range from  $\frac{3}{8}$  to half circle to  $\frac{5}{8}$ . The latter requires more rotation to deliver the needle out of the tissue – the choice is dependent on your ability to complete the rotation of the needle and pick it up cleanly, the tissues, the depth and accessibility of the operative area. This can be judged by your ability to affect a backswing to get the needle to point into the tissue at ninety degrees.

Ninety degrees is the perfect angle. It is the fourth part of a circle. It is described by Euclid and this simple mathematical principle enabled the builders of ancient time to draw a perfect ninety degrees squares with a length of string holding a marker to describe the surface and rotating it around a fixed radius and varying the length of the string. Try it for yourself.

Ninety degrees is the perfect angle as all the other angles in all orthogonal planes are also ninety degrees. Consider the way you stitch a button to fabric. The easiest passage is achieved by ensuring the needle is ninety degrees to the fabric. The same applies to the tissue. The champion springboard diver in the Olympics wins if they enter the water without a splash – the entry to the water is at ninety degrees. The low fidelity models used by BBASS are the cooked potato, the bananas, and the poached egg – these 'splash' models are unforgiving and will give feedback if the rotation of the needle is poor.

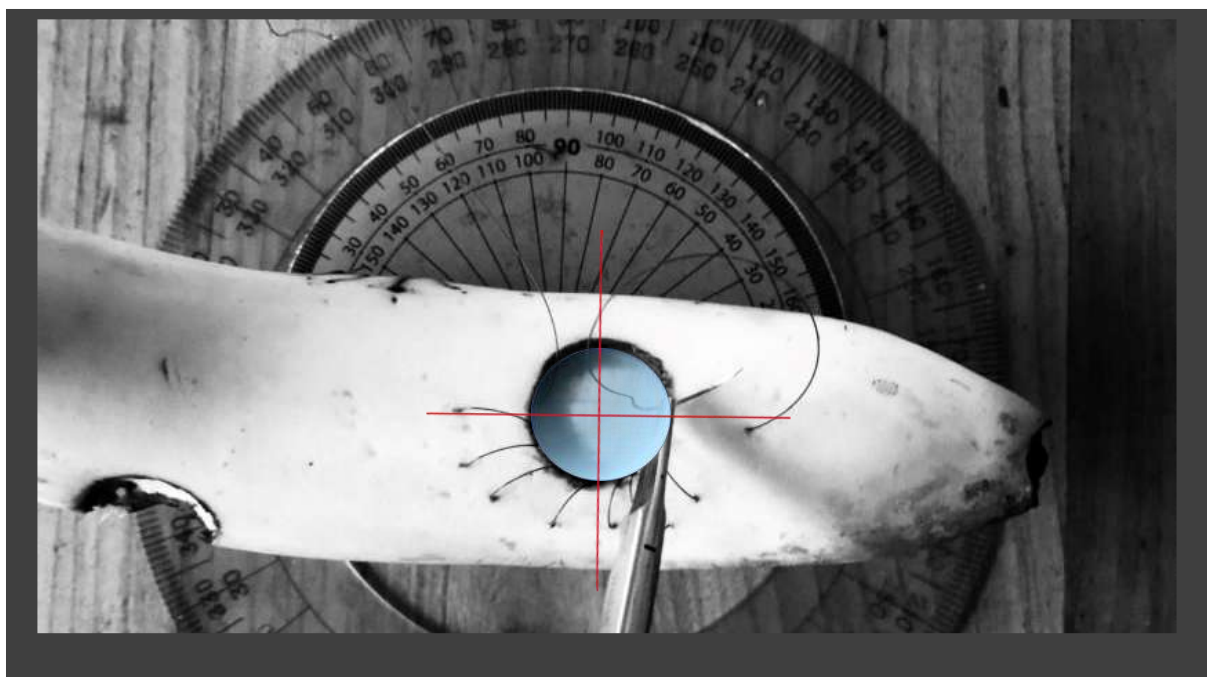




If the rotation of the needle is clean, the needle exits the tissue at ninety degrees and ready to pick up. It may need a slight nudge to get the new angle and do not grab the needle, use the shaft shape, and enable the needle to settle into the correct position. Remember the checks.

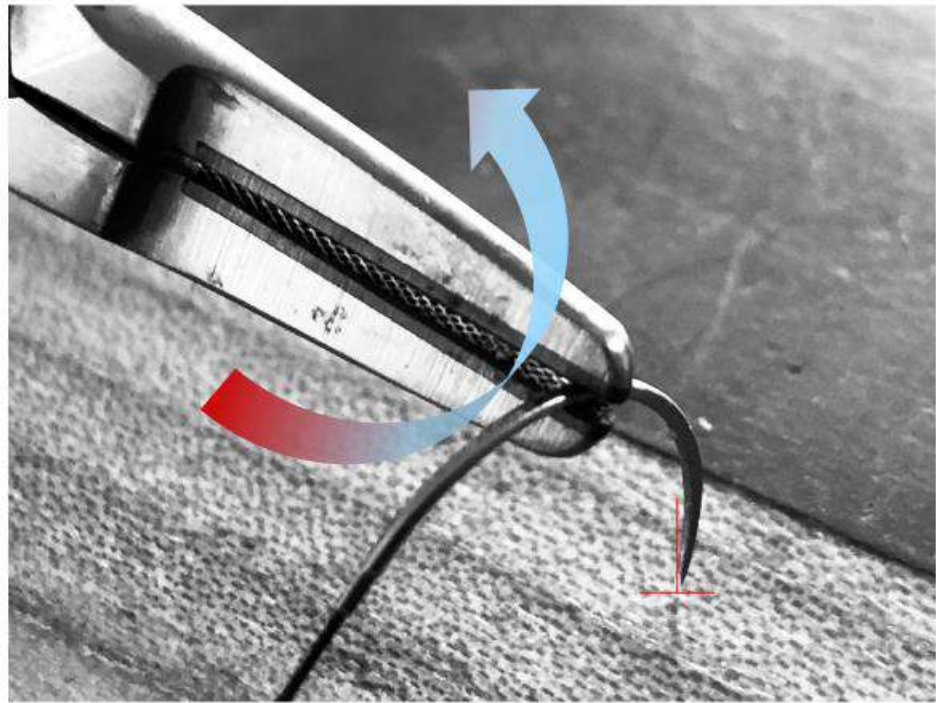
## Alignment

The Needle must enter the tissue at ninety degrees in all orthogonal planes. This dictates your posture and the address to the table and whether the stitch is forehand or backhand. Each edge and each stitch are so aligned - ninety degrees no matter the shape.



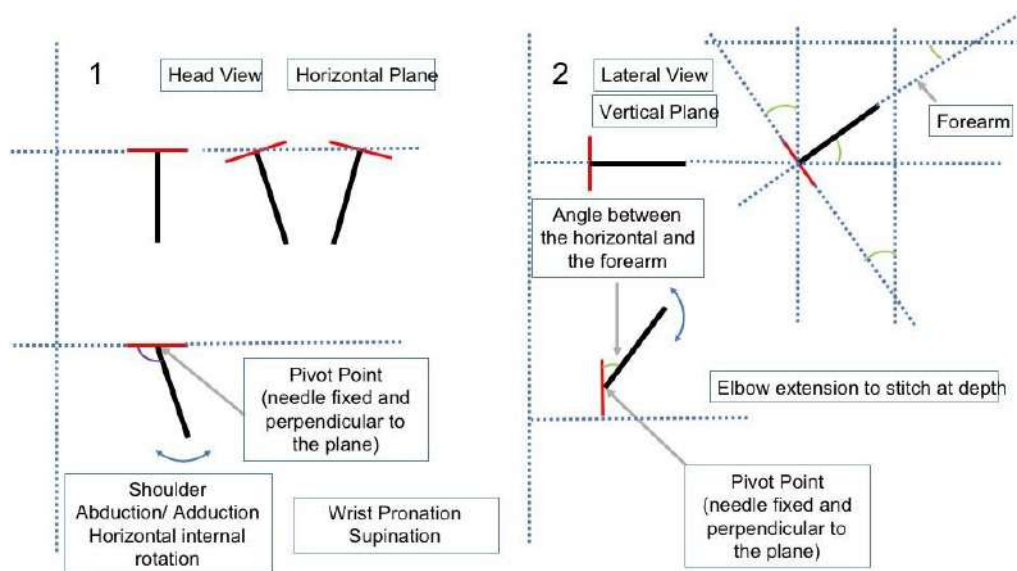
**Lastly, a simple way to check yourself before every stitch.**

- Place the needle at ninety degrees across what you want to stitch.
- Rotate the needle back and unlock.



- Point the needle into what you want to stitch.
- Rotate the needle cleanly through tissue like throwing a ball.
- Pick up with your three checks.
- Repeat again and repeat all the steps.

## From Charilaos Harris – needle angles



## From the Ethicon site – types of needles

