Needle holders - a stitch in time

History

Archaeologists have found bone and later metal 'needles' that they presumed were used for suturing. The ancient Egyptians became adept at suturing during the mummification period. All the early needles were handheld and had to be threaded (French eye needles) not unlike a needle and thread. Hippocrates recorded his use of sutures. Plant material was used at first and Galen recorded the use of sheep's intestine – catgut.

Pivoting surgical instruments have been found be by archaeologists in Egypt and Pompeii. Galen was the first to describe the haemstat for clamping bleeding vessels which was then forgotten rediscovered by the French barber-surgeon Ambriose – Pare in the 16th century. It is not inconceivable that these pivoted instruments were then adapted to hold suturing needles.

Smaller needles and the advent of the curved needle heralded the need for the needle holder as the needle could no longer be held in the hand and the needle needed to be driven through the tissues. Needle holders are also called needle drivers. They consist of jaws, a joint and handles. The jaws are short thereby maximising the levers and forces. They usually have tungsten carbide inserts (granules in cobalt or other metallic paste) that are textured to maximise the hold on the shaft of the needle. Some even have diamond dust. Examples of needle holders: Ryders, Mayo-Hegar, Crile - wood, Olsen-Hegar, Collier, Metzenbaum, Julian and Webster to name but a few: The list is almost endless; anyone who was someone appears to have given their name to a needle holder! All these carry the names of the surgeons who designed their needle holders to optimise the ergonomic function. The Gillies needle holder is specifically designed with one large ring for the thumb on a shorter arm and a smaller ring on the longer arm. This needle holder is to be held in on the pulps of the fingers

The Heaney needle holder has curved jaws.

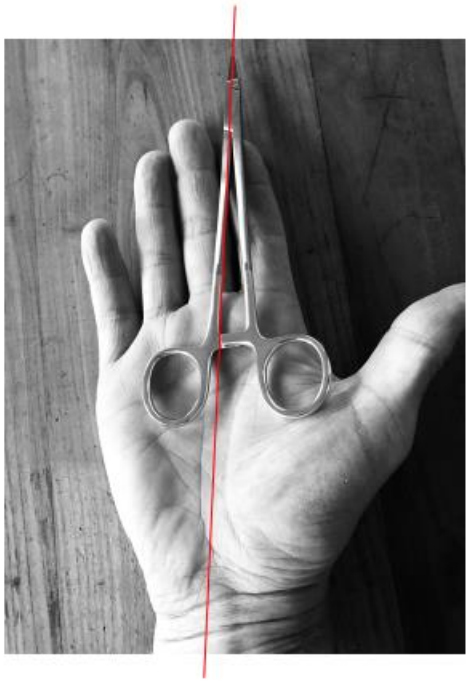
The Sarot needle holder has stepped arms.

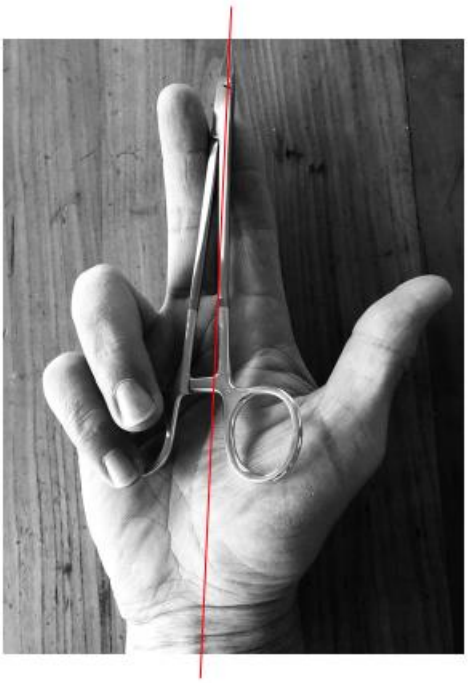
All these modifications were deemed necessary by their designers to fulfil a specific function. Some even combined the function of a needle holder and scissors to cut the suture. Almost all have a rachet mechanism for locking the needle in place.

Handling

The handling of the needle holder can be improved by 'palming' the instrument. It is interesting to see that a surgeon wrote to the JAMA to explain this technique in 1975 only to be informed that many American surgeons had already adopted the technique of holding the needle holder in the hand without inserting the fingers in the rings. This make a lot of sense as the needle holder is then perfectly aligned with pronation and supination of the forearm and the shoulder, through circumduction, can hold the forearm at any angle. This is evidenced by the fact that a screwdriver can be used in the most awkward of places and angles

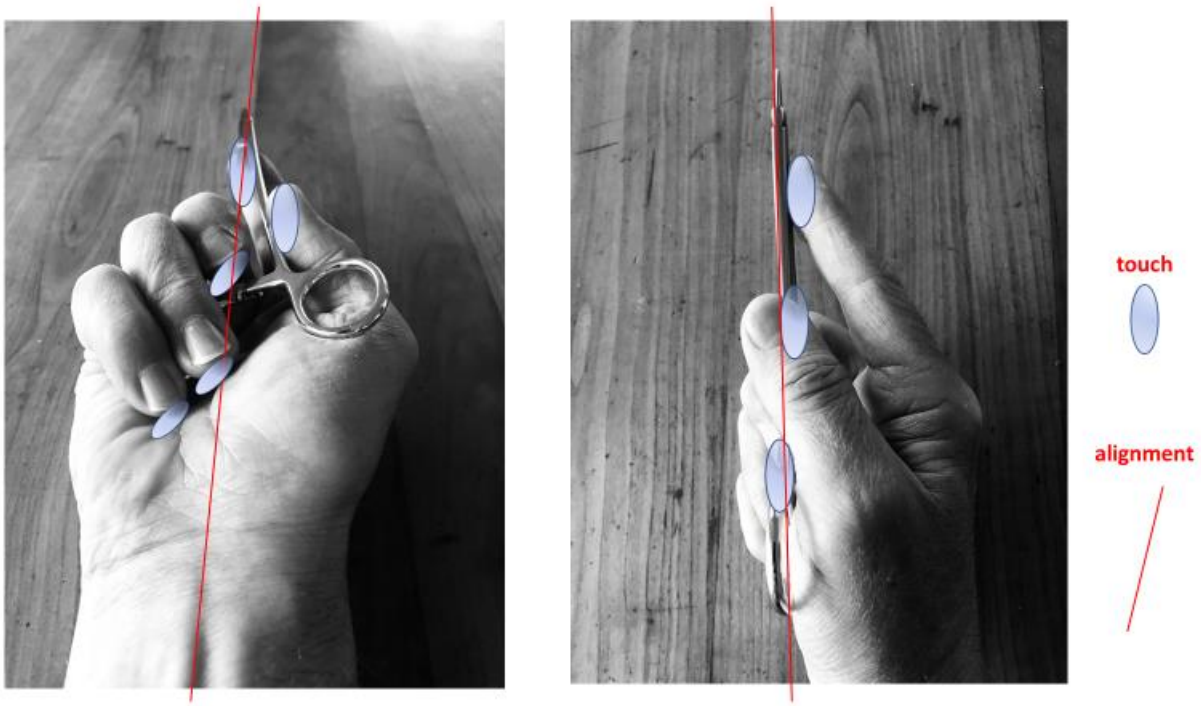
The needle holder should lay in the palm with axis directed between the index and middle fingers.





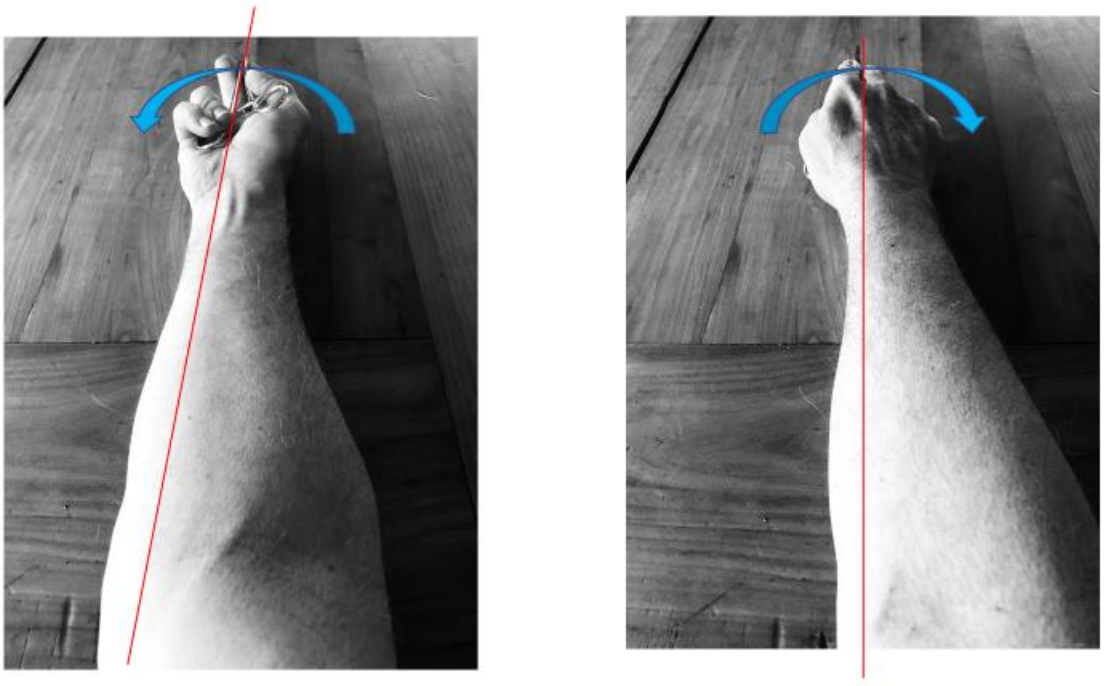
The instrument is supported between the pulps of the ring and small fingers and the thenar eminence. The pulp of the thumb and middle finger support the shaft, and this is further stabilised

with the pulp of the index finger. This offers stability and the pulps of all the fingers are in contact with the instruments affording the lightness of touch, proprioception, and control.



Action

The alignment is with the alignment of pronation and supination of the forearm i.e. from the common flexor origin of the ulna to a point between the index and ring fingers. Rotating the forearm and back akin to using a screwdriver increases the degrees of rotation and ensures the tip of the needle holder does not deviate.



The action of pronation and supination is unique to humans, and only the forearm as it allows us to flip the hand over. The radius, held to the ulna by the interosseus membrane, literally folds across the ulna. The supinator muscle is a broad cylindrical muscle arising mainly from the lateral epicondyle of the forearm that curves around to the upper end of the radius. The forearm muscles of pronator teres and pronator quadratus pronate. These are the smaller less powerful of the intrinsic muscles of the forearms and should be used as such – the most powerful supinator the biceps should be reserved for the more challenging of DIY jobs!

The fingers are not in the rings of the needle holder and therefore the handling and picking up and putting down of the instrument is easier.

There is a rub. Most needle holders have rachets - the action to release the rachet and the needle and reapply, to the secure the needle, requires palmer displacement of the thenar held arm of the needle holder with the thenar eminence using your opponens policis muscle (arises from the flexor retinaculum and the tubercle of the trapezium and inserts into the radial border of the first metatarsal) and the laterally placed abductor policis brevis (arise from the scaphoid, trapezium and flexor retinaculum and inserts into the lateral aspect of the base of the first metatarsal with an sesamoid bone). The flexor policis brevis (arises scaphoid and trapezium and inserts lateral side at the base of the first metacarpal) is used to reapply. These are the three intrinsic muscles of the hand that make up the thenar eminence. This requires practice and is made easier with lighter and longer needle holders. Of course, it is easier with larger hands. It is interesting to note that gymnasts that work on bars do specific thenar eminence exercises to improve grip strength. It is recommended to have a needle holder in your pocket and regularly practice locking and unlocking the needle holder to develop these muscles to became and expert surgical ‘gymnast’.