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Introduction to Net Mending

Albert J. Hillier
Conrad W. Recksiek

Fisheries and Marine Technology
NOAA/Sea Grant



University of Rhode Island
Marine Bulletin 48

\$4

Acknowledgments

We gratefully acknowledge the enthusiasm and dedication of Jane Brawley, of the University of Rhode Island Photo Services, for her invaluable help and extensive laboratory work.

This publication is sponsored by NOAA Office of Sea Grant, U.S. Department of Commerce, under Grant #NA81AA-D-00073. The U.S. Government is authorized to produce and distribute reprints for governmental purposes notwithstanding any copyright notation that may appear hereon.

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Introduction

This manual presents the basic operations in the repair of nets through several series of photographs demonstrating a professional and efficient technique. The idea for the manual grew out of the need for a clear illustration of the basic net repair sequences. Experiment showed us that about 20 views are required for each of the six fundamental knots; therefore, drawings were not feasible. Short of making a film (net repair films have been made), a series of still photographs was thought appropriate. The photographs were staged and taken by the authors.

Introduction to Net Mending has been designed to serve as an accompanying text in a net repair course. We believe that a beginner who wants to learn the craft of net repair without verbal instruction can use this manual, even though introductory material has been kept to a minimum. We recommend that such a student peruse the manual thoroughly *before* picking up a net needle, since the material in its entirety will demonstrate the technique.

The Basic Operations

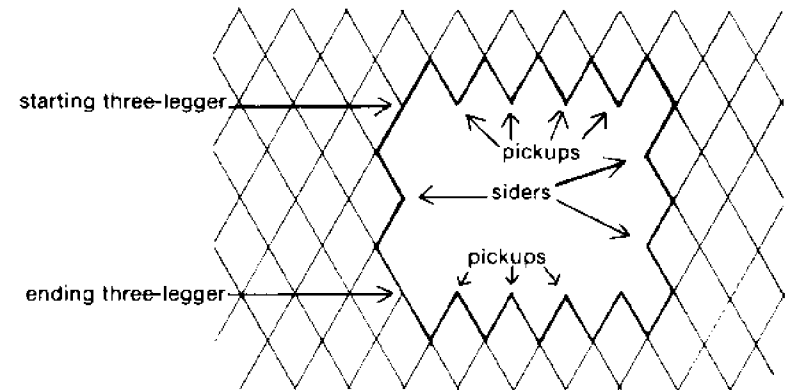
Netting, or webbing (also, "web"), can be considered a gridwork of knots. A repair of torn webbing is effected by retying every knot and replacing all lost material completely. A repair should not be readily apparent from a distance.

The repair of a hole or tear in webbing is initiated by first *trimming* it in a systematic way. Once this is accomplished, the trimmed hole is sewn closed, using one continuous piece of mending material, which for convenience is wound onto a needle. A trimmed hole includes the following key elements:

- 1) a starting knot, or *starting three-legger*;
- 2) knots which line the borders of the hole, or *pickups* and *siders*; and
- 3) an ending knot, or *ending three-legger*.



An *ending three-legger*. Note that a repair has almost been accomplished. By fastening the mending twine to the ending three-legger, the repair is completed.



A three-legger, the starting or ending knot of the repair sequence, is a knot having "three strands intact"—that is to say, the three-legger knot has one of the strands which lead to it cut; all others are intact and are part of the net piece which is being repaired.

Every other knot lining the trimmed hole has two of its original strands intact. Note that every knot not lining the

hole of the piece being repaired has "four strands intact." The knots lining the hole having two strands intact are the *pickups* and *siders*, the two basic knots used in the repair of nets. The *pickup knot* is an ordinary sheet bend and the *sider knot* is a kind of doubled hitch.

Trimming is accomplished by placing a starting three-legger in the uppermost row of pickups of the hole and by placing an ending three-legger in the lowermost row of pickups. Every other knot bordering the hole must be a pickup or sider.

The distinction between "sider" and "pickup" is important. The web is fabricated, either by hand or by machine, row by row with succeeding meshes such that each row consists of one continuous strand. For example, if one were to cut a piece of webbing evenly from side to side, the same strand piece would be cut (leaving, incidentally, a line of pickups). When a hole is trimmed leaving pickup and sider knots, the major difference between them becomes clear: the sider knot can be untied, leaving free strands leading to "new" three-leggers above and below; the pickup knot, consisting of a single strand knotted to a fragment of a previously existing strand, when untied, leaves a complete free mesh plus a fragment of the other. The *run of the twine*—i.e., the orientation of continuous strands in rows of meshes—must be recognized before initiating repair. The run of the twine is also the direction in which one would stretch the webbing so as to tighten the knots. The student is encouraged to make experimental cuts in a new piece of webbing (knots in new webbing usually untie easily; knots in old webbing or those in monofilament usually untie with difficulty).

The trimmed hole is now repaired by forming row after row of new pickup knots. A reversal of direction from one row to the next is made by encountering and tying to a sider knot.

The last row of pickups is tied not only to pickup knots above but to pickup knots below.



One of the two fundamental net knots, the *pickup knot*, a sheet bend. Note that the original twine of the pickup is continuous.



The second of the two fundamental net knots, the *sider knot*, a kind of doubled hitch which holds the original twine above and below the knot of the original web. Note that the sider knot effectively prevents the original two strands from untying.

The three-leggers, incidentally, are tied in the same way as a pickup knot, but with an extra hitch to form what is essentially a double sheet bend.

There are, therefore, six fundamental knot-tying situations:

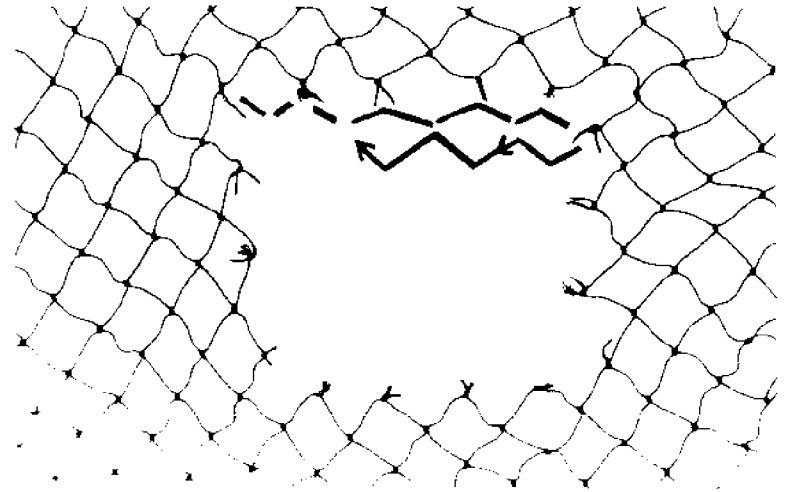
- 1) pickup knot tied above while forming a new row to the right;
- 2) pickup knot tied above while forming a new row to the left;
- 3) pickup knot tied below while completing a row to the right;
- 4) pickup knot tied below while completing a row to the left;
- 5) sider knot on the right; and
- 6) sider knot on the left.

The substance of this manual is the methodology of tying each of the six knots. In our opinion, the technique presented will, with practice, lead to accuracy and speed.

It should be mentioned that for large holes it may be efficient to use a patch instead of weaving the repair. In that case, a square hole is made lined with pickups and siders on top and sides, respectively. A patch of the appropriate size is cut. Then, starting on a pickup (say, in the upper left corner), a row of pickups and a following column of siders are connected. The start and end knots have formed starting and ending three-leggers to complete the final side and row.

The student is encouraged to cut out and trim a small hole and attempt to repair it. There shouldn't be any concern about the precision of the three-legger knot at first—a double sheet bend tied on in whatever way found convenient will do. Later, after having learned to use the needle, the three-leggers may be tied like pickups but with an extra pass of the needle.

The needle is filled in a straightforward manner (see page 6).



A cutout hole ready for repair. The drawn lines indicate the knot-tying sequence. Note starting and ending three-leggers.

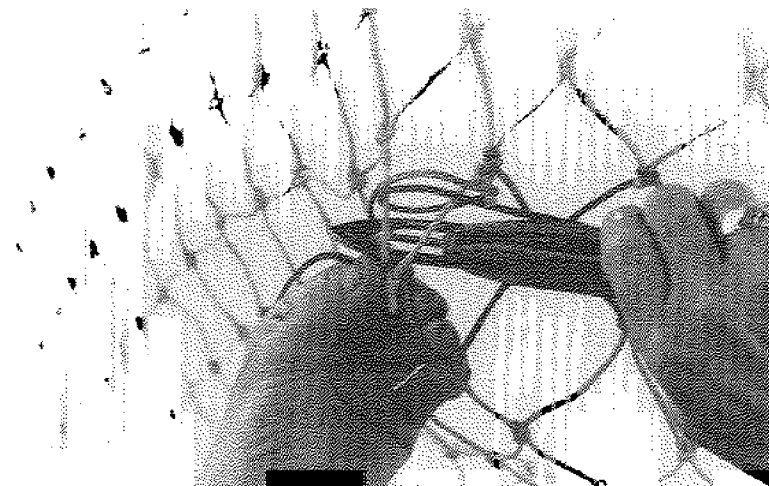
The essential trick is to rotate the needle briskly with the fingers so as to receive the *mending twine* being fed by the opposite hand.

The six fundamental knots, for brevity called Pickup Above Going Right, Pickup Above Going Left, Pickup Below Right, Pickup Below Left, Sider on the Right, and Sider on the Left, are best mastered by a study of the illustrations and simultaneous experimentation. After tying to a starting three-legger, the student should go on to whichever of the six knots is called for. In the diagram given on page 2, for example, after the starting three-legger one would tie the following knots: 4 pickups above going right; sider on the right; 4 pickups above going left; sider on the left; 4 pickups above going right; sider on the right; 4 sets of pickup below going left, followed immediately by a pickup above going left; and, finally, an ending three-legger (a pickup below going left, double-hitched).

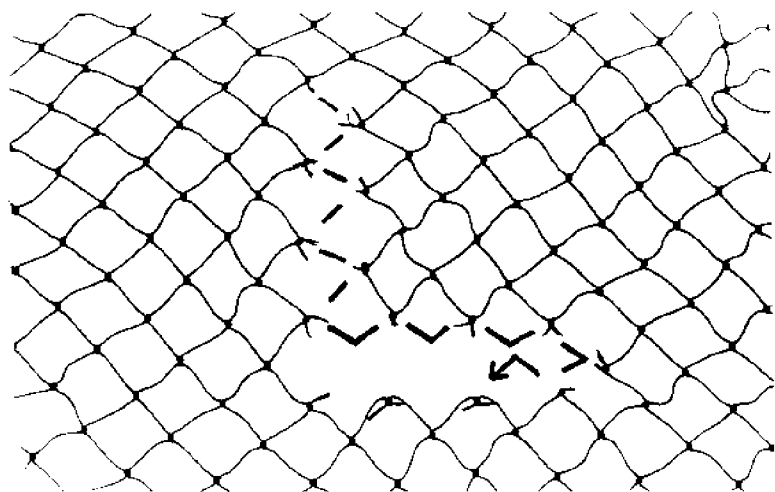
If the needle should run out of mending twine, the ordinary fisherman's knot is handy for fastening the ends.



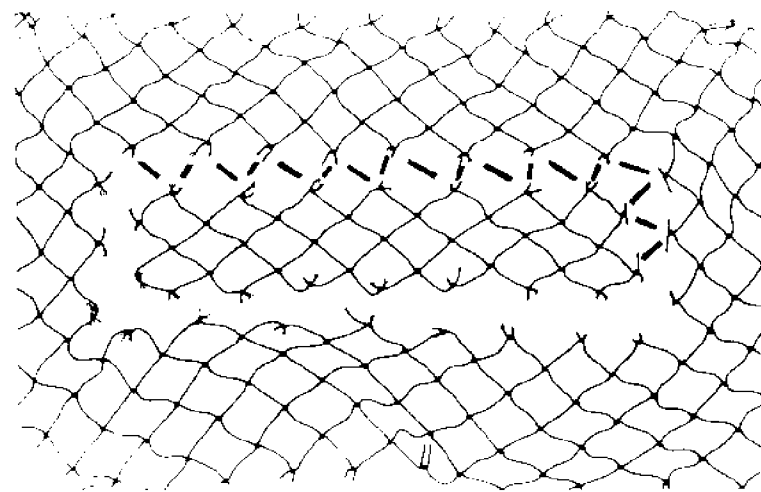
A final row of pickups about to be formed. Note ending three-legger on the right.



A *double sheet bend*, or regular pickup knot plus an extra hitch, is used to tie to a three-legger.

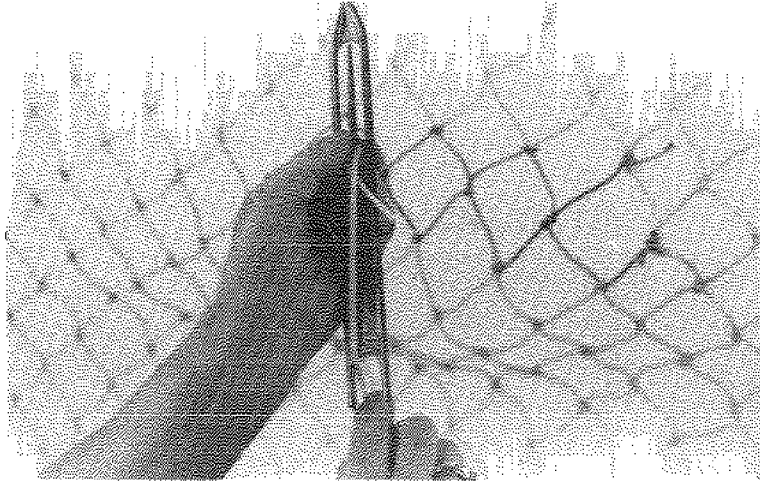


A repair sequence showing the formation of the final row of pickups.

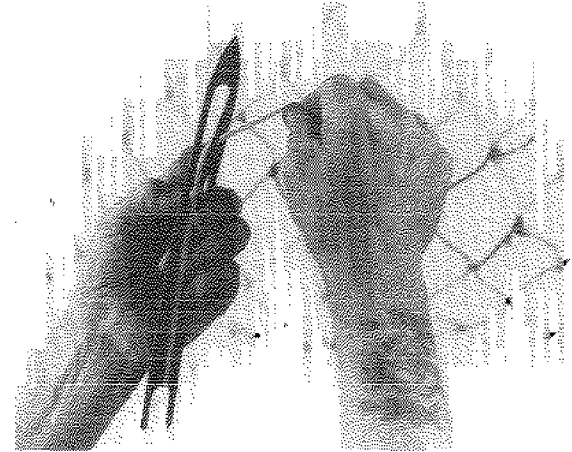


A patch. With larger holes, fitting a patch is more efficient than knitting. By starting the repair on a pickup, a starting three-legger is formed in anticipation of completing the left-hand column of pickups and the lower row of pickups.

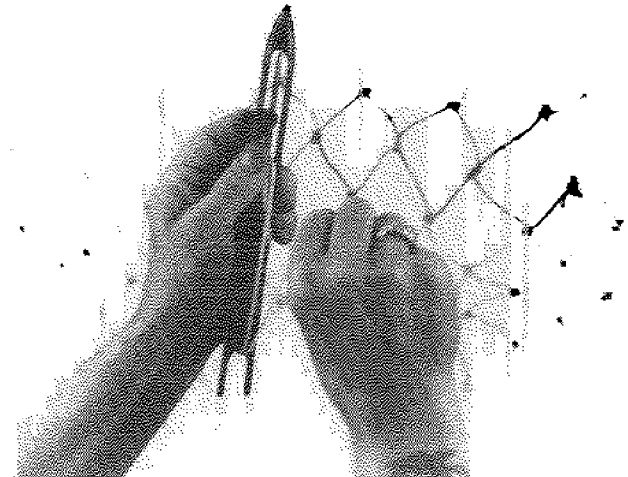
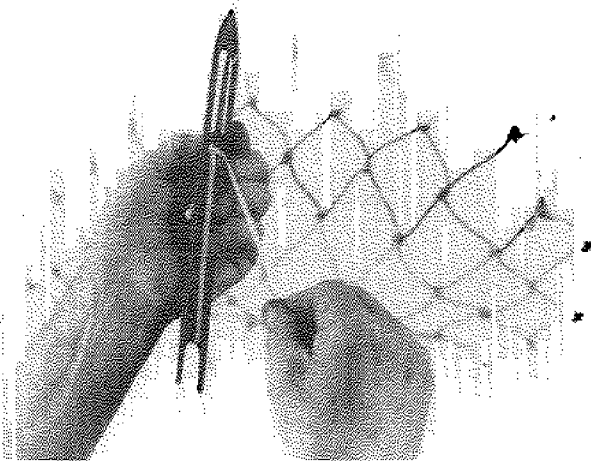
Filling a Needle



The twine is bent around the heel. The needle is held so that...



...it can be flipped over to receive the twine on the other side. Note the finger pressing on the tongue.

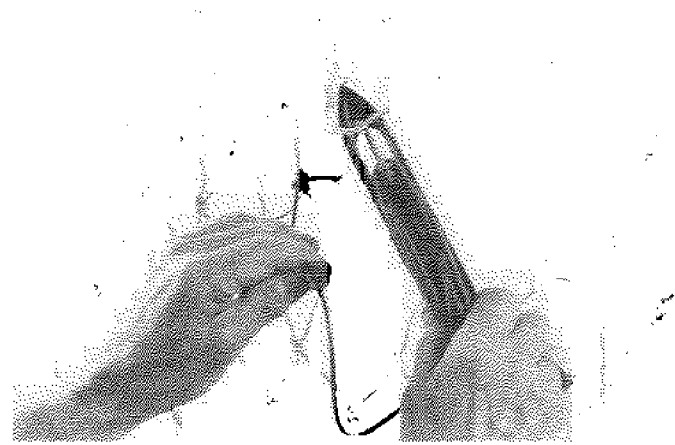


The needle is now flipped back to the initial position, with the finger positioned at the tongue. As the needle fills, the left hand moves gradually toward the point.

Pickup Above Going Right



Begin *pickup above going right*. Note how twine is held in left hand. This frame also illustrates a starting three-legger.

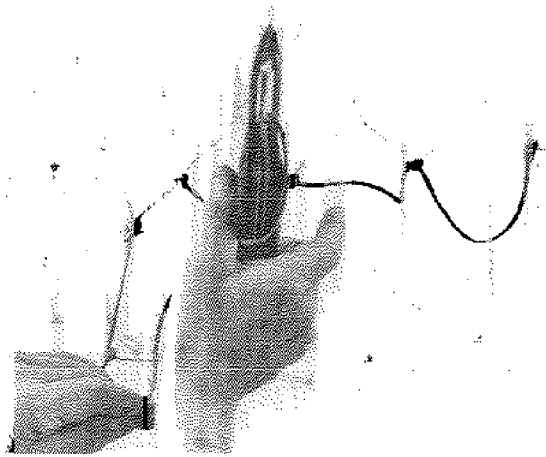


Thrust needle through pickup. Note how needle is held by its after end and not in the middle.

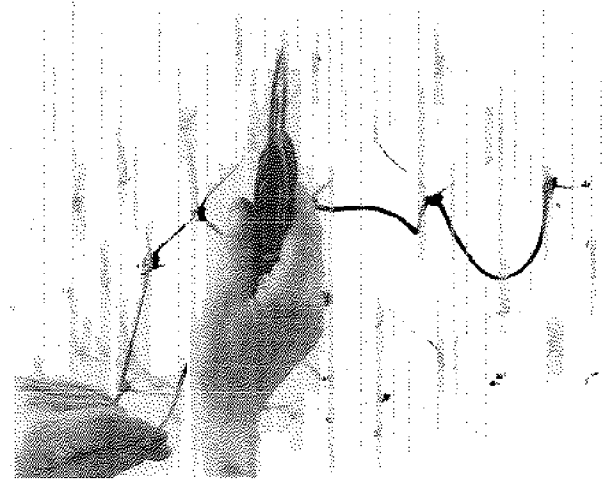


Thumb has lifted to clear strand of pickup ...

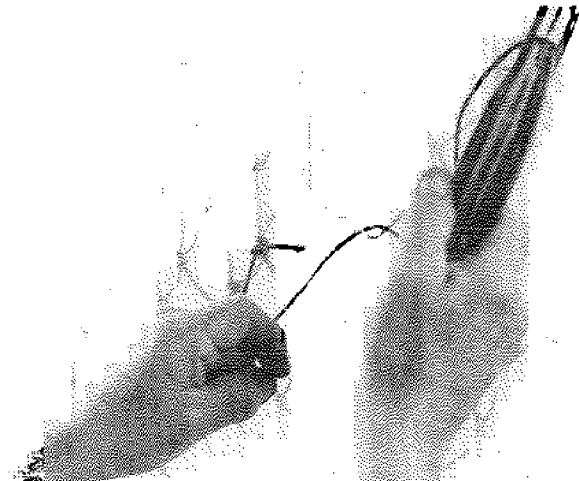
Pickup Above Going Right (Continued)



...and now forefinger follows suit...

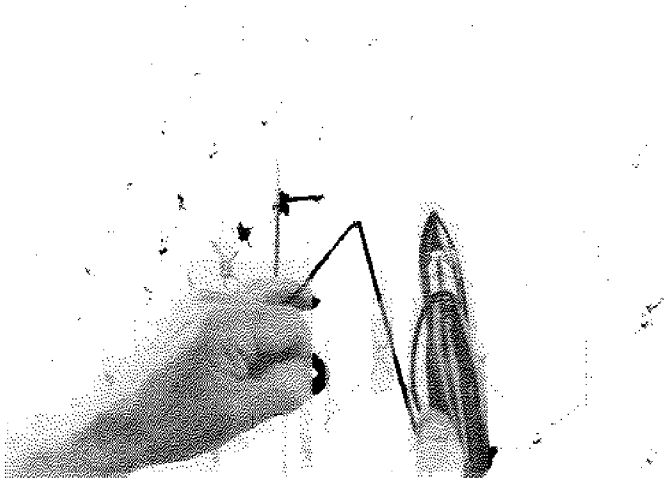


...so that both fingers close to catch needle on other side.

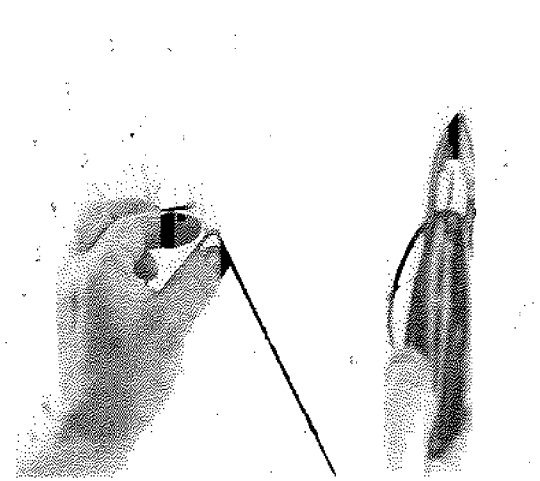


Twine is drawn through pickup, and all but one finger of the left hand controls the shape of the intended mesh.

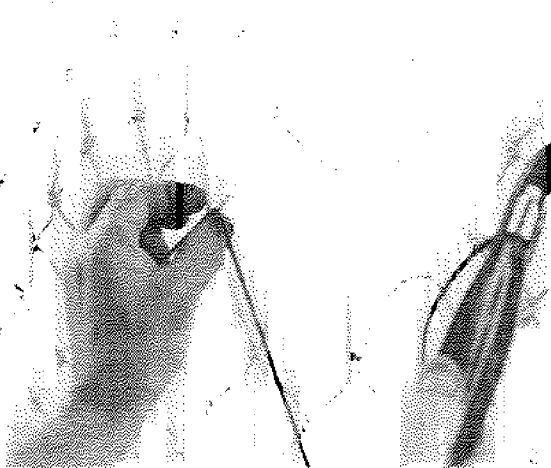
Pickup Above Going Right (Continued)



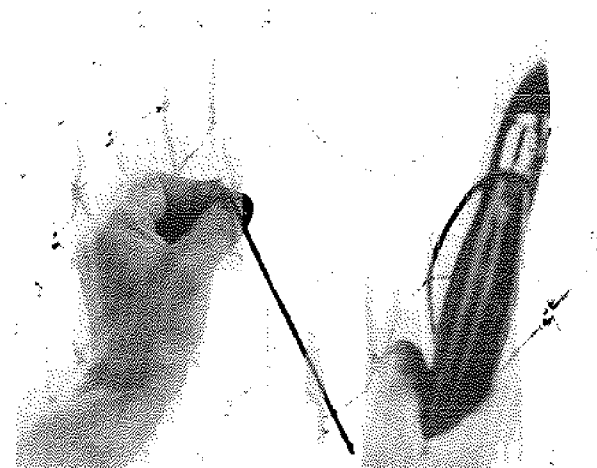
The new mesh is adjusted between pulls of the finger and needle.



Thumb and forefinger move toward overhand knot...



...with thumb positioned underneath.

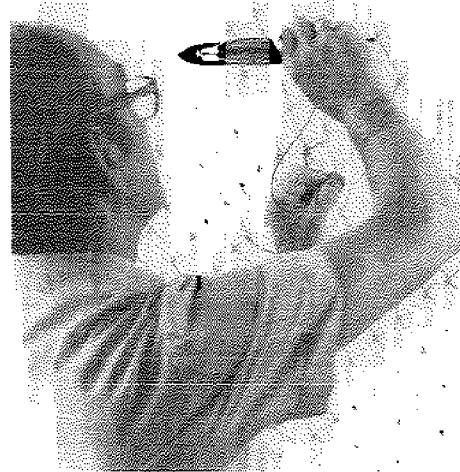


Twine and pickup are now grasped firmly.

Pickup Above Going Right (Continued)



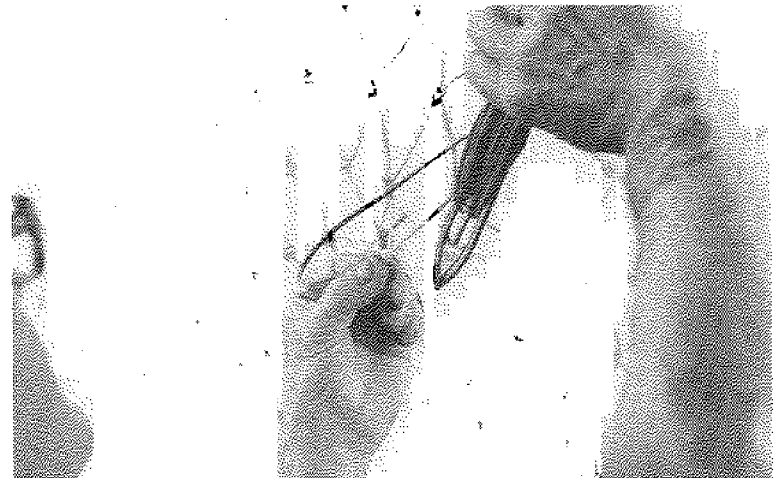
A combined movement of needle and sharp twist of the left hand...



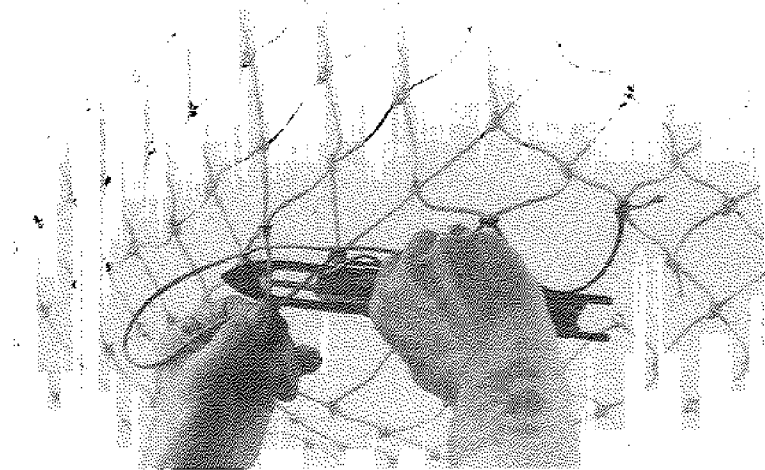
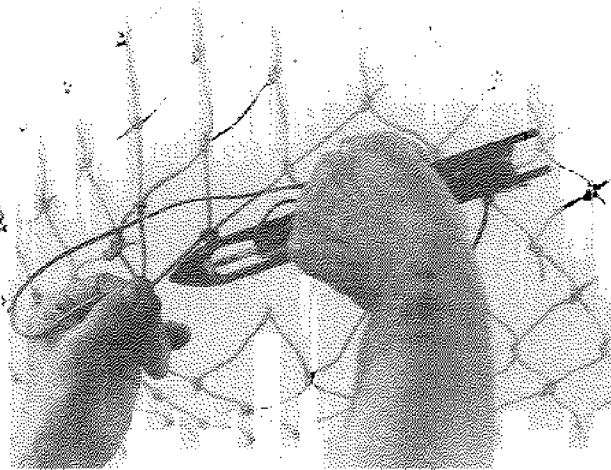
...serves to flip the twine across the left hand...



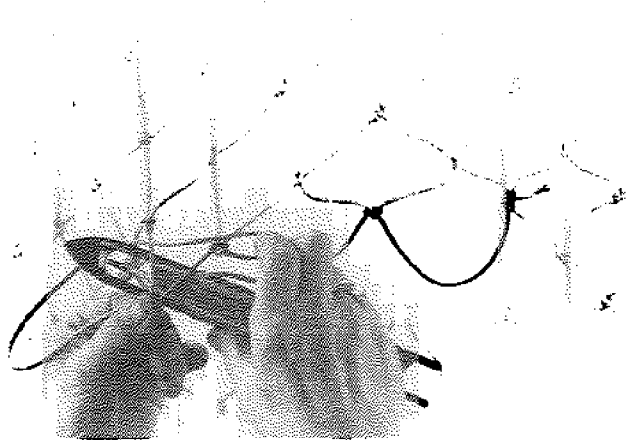
... so as to form a loop to receive the needle as it is thrust across. This movement is helpful in developing speed in mending.



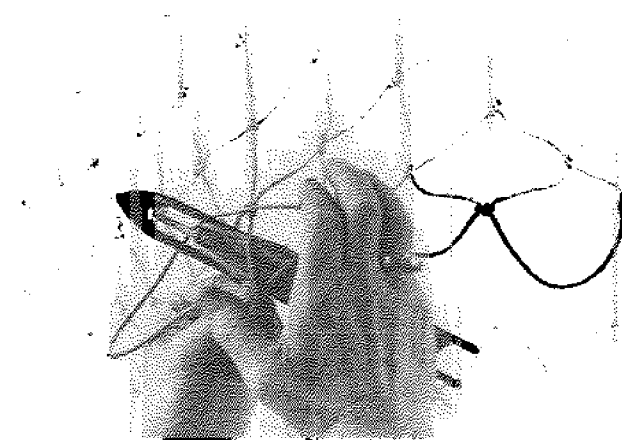
The needle is now approaching pickup.

Pickup Above Going Right (Continued)

Needle is now taken behind pickup and through loop, which was formed earlier by the sharp twist of the left hand.

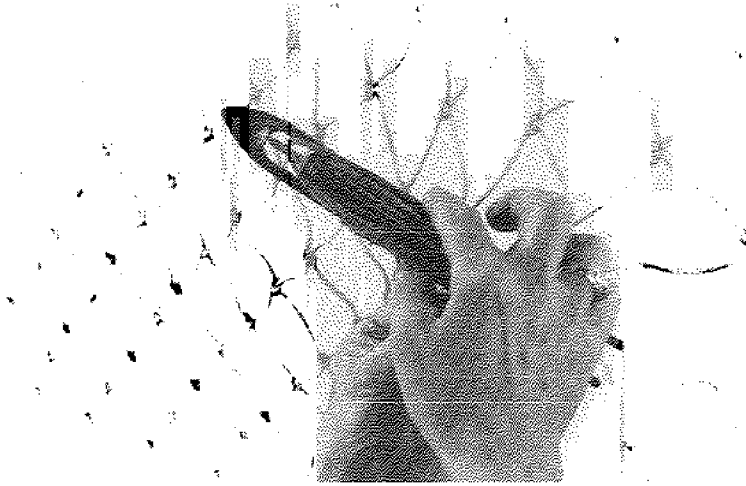


Thumb and forefinger begin to lift...

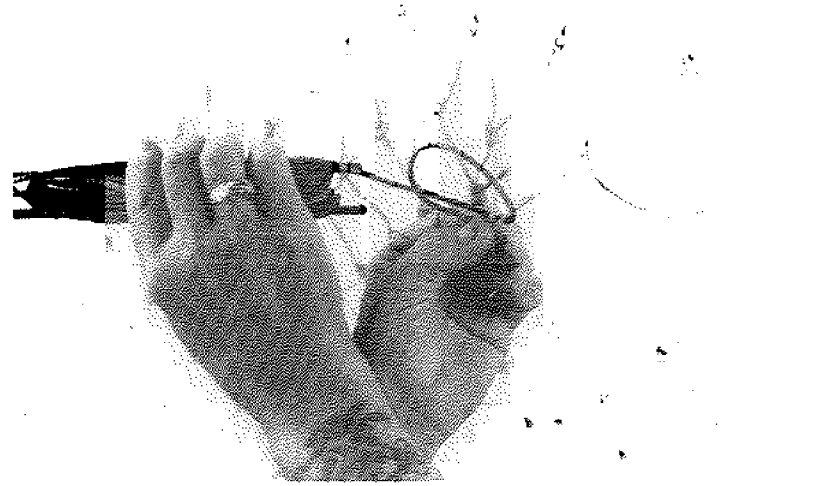


...as needle passes through...

Pickup Above Going Right (Continued)



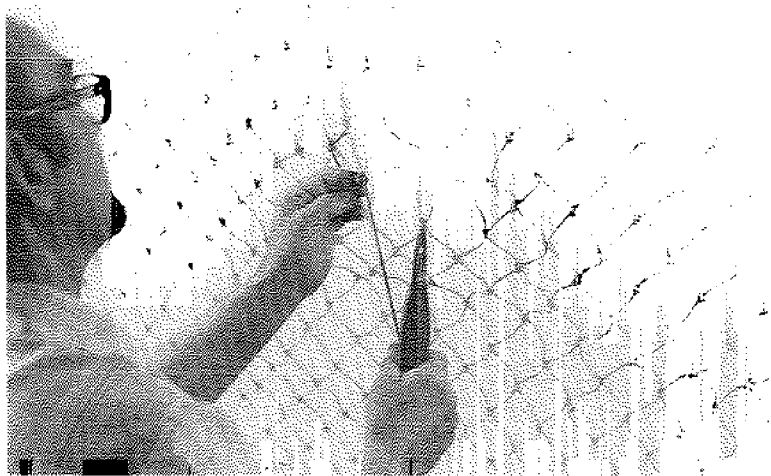
...to be caught by these fingers on the other side.



Hitch is now drawn up.

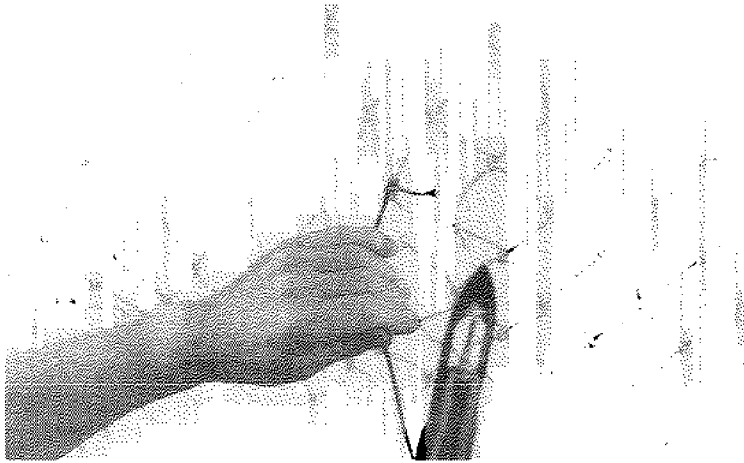
Pickup Above Going Right (Continued)

Needle is pulled until hitch is forced onto thumb and forefinger.

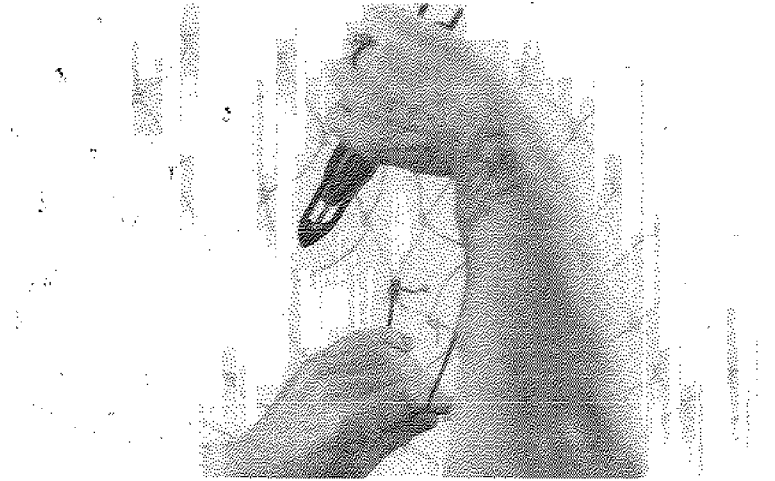


The knot is set by a firm downward pull. Note how needle is held. Twine pulls against bottom of needle; thus, the right hand does not pull on the twine directly, preventing blisters.

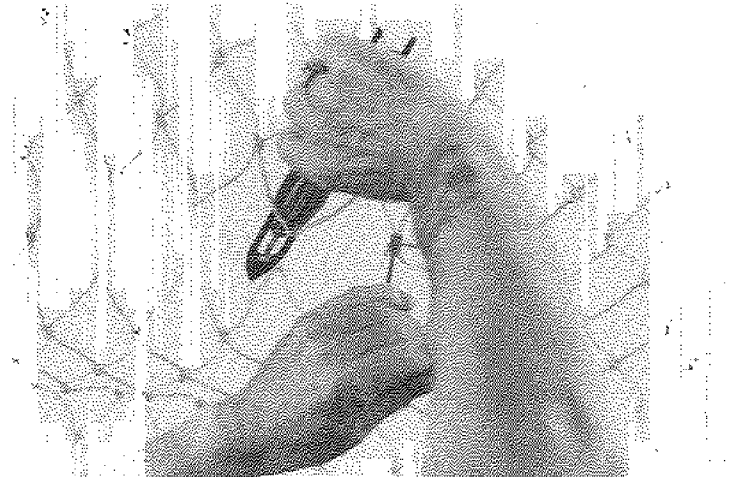
Pickup Above Going Left



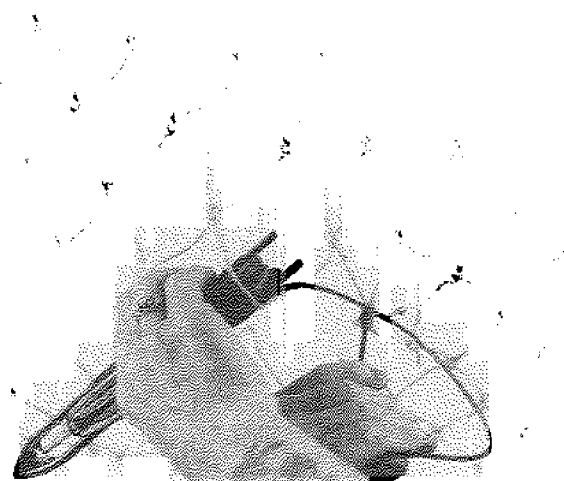
Begin *pickup above going left*. Note how left hand holds twine. This frame illustrates starting three-legger with ending three-legger immediately below.



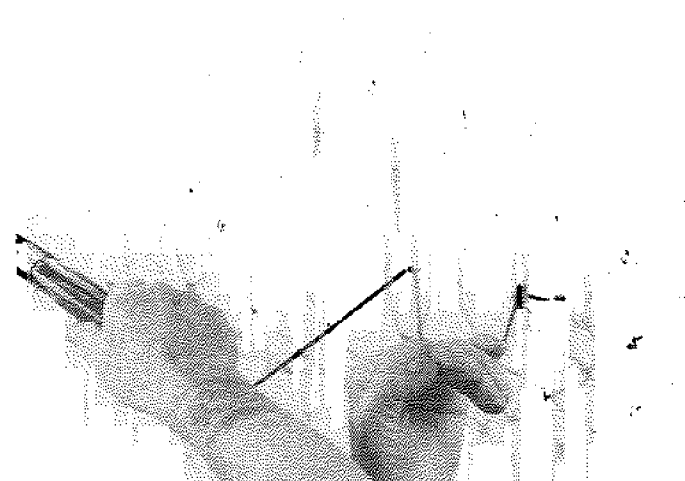
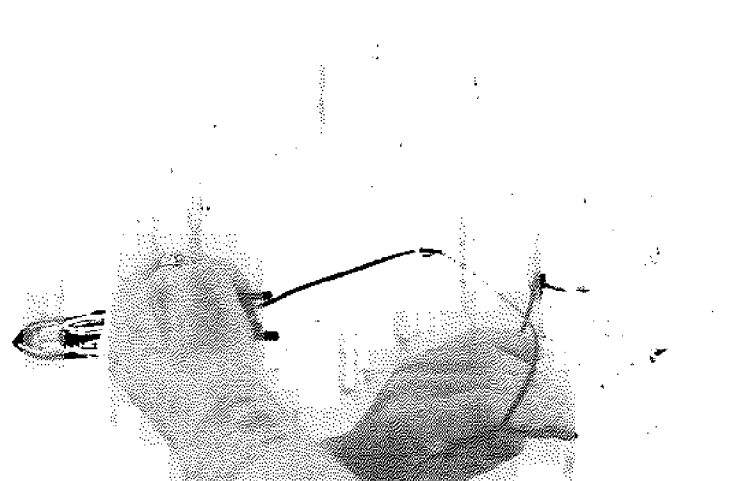
Needle is thrust toward pickup.



Thumb and forefinger lift to clear pickup strand as needle passes through...

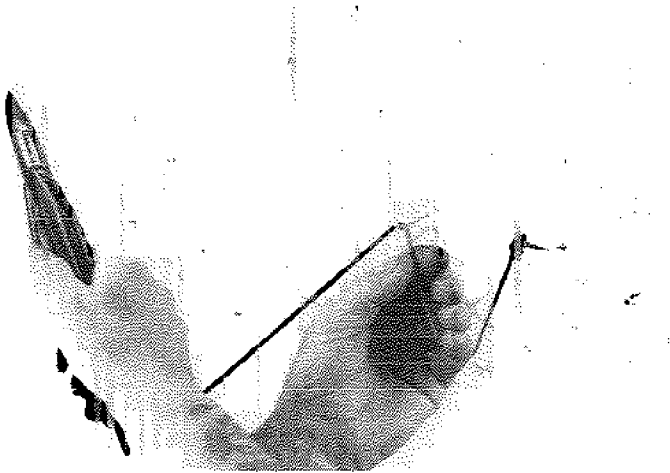
Pickup Above Going Left (Continued)

...to catch needle on the other side.

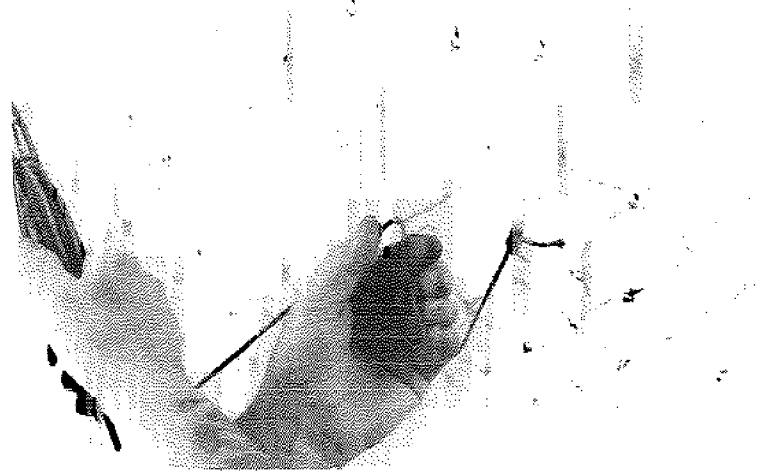


As twine is drawn up...

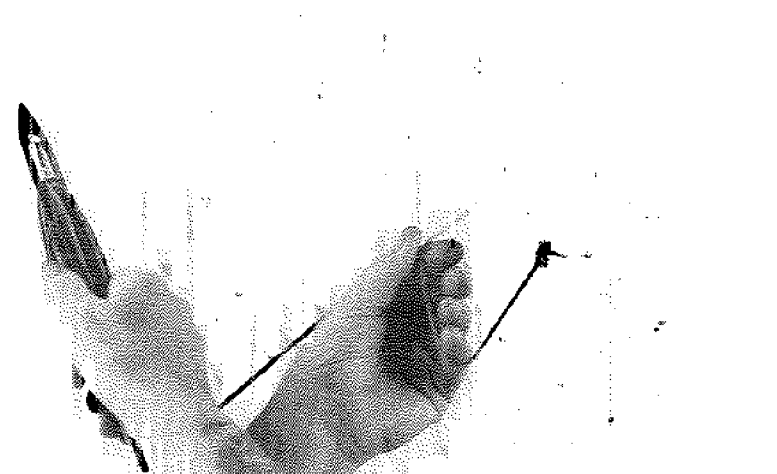
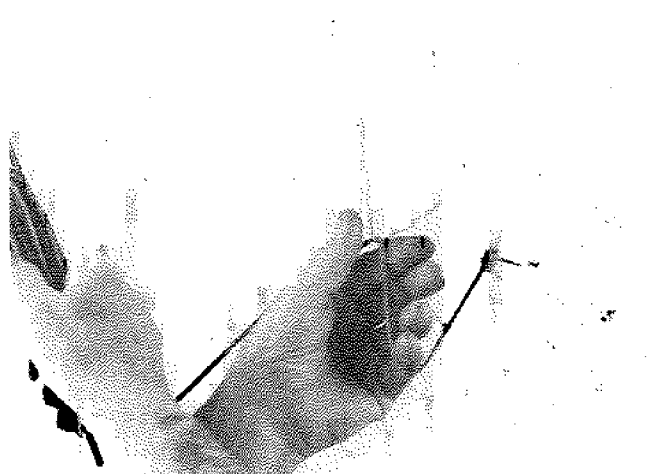
Pickup Above Going Left (Continued)



...last finger of left hand delimits new mesh while...



...thumb and forefinger slide toward new overhand knot above.

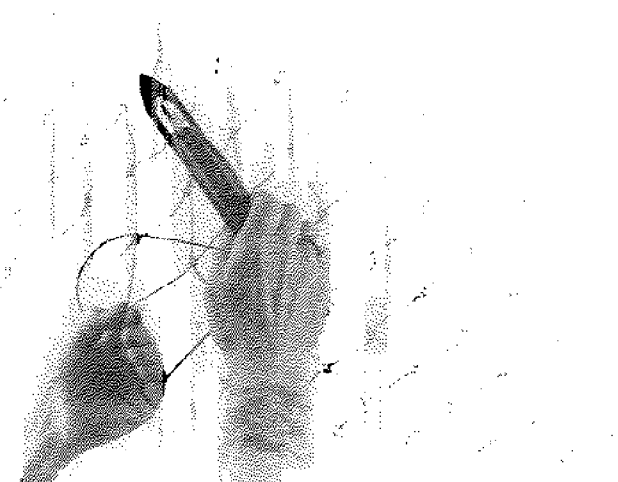


Overhand knot is now held securely between thumb and forefinger.

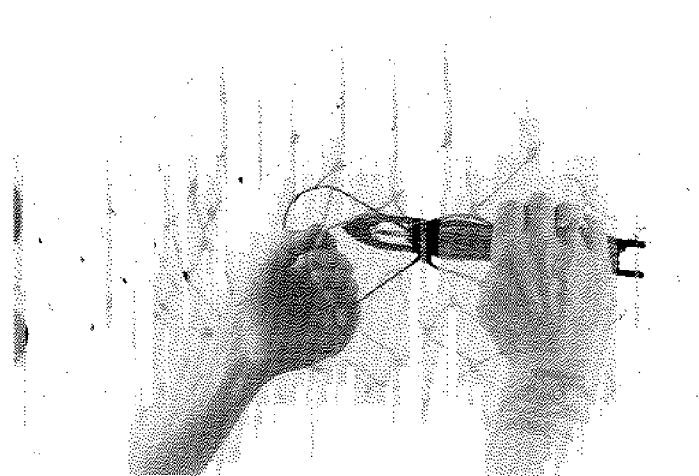
Pickup Above Going Left (Continued)



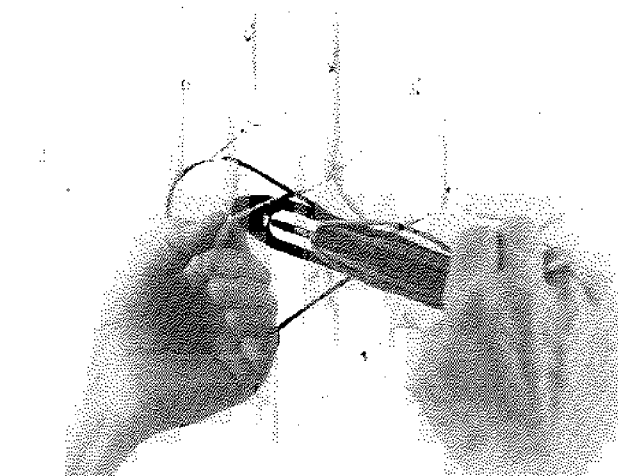
The needle is now raised rapidly...



...so that a loop is formed above and to the left of the left hand. This loop will receive the needle as the final hitch is tied. Forming this loop will facilitate developing speed in mending.

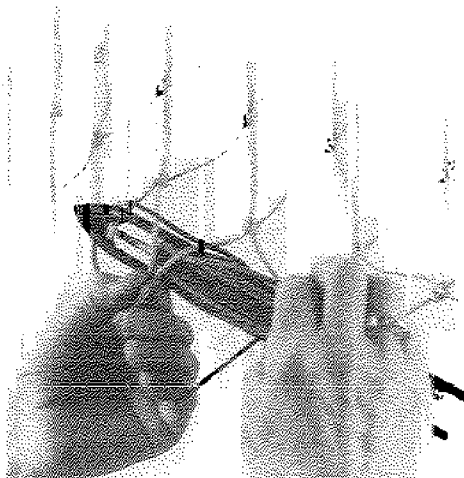


Needle is thrust toward...

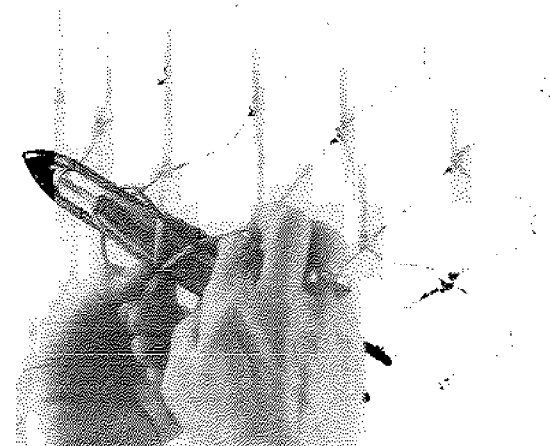


...and behind pickup...

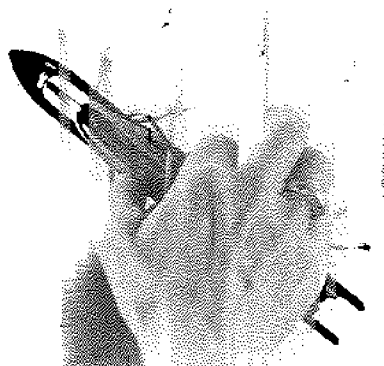
Pickup Above Going Left (Continued)



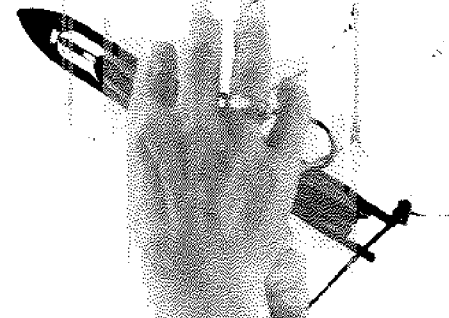
...through previously formed loop.



Thumb and forefinger begin to lift off needle as needle passes through.

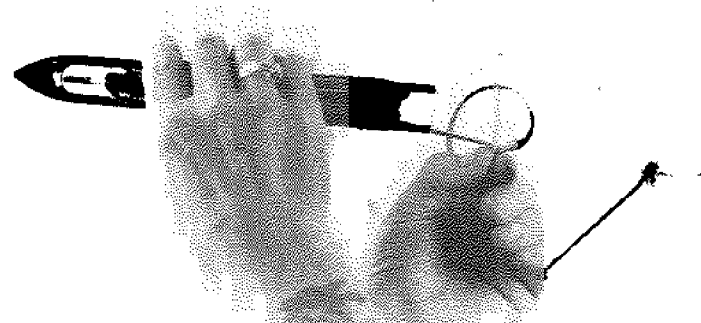
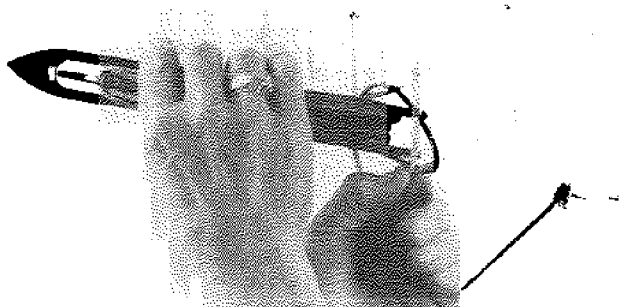


Thumb has slid across pickup strand...

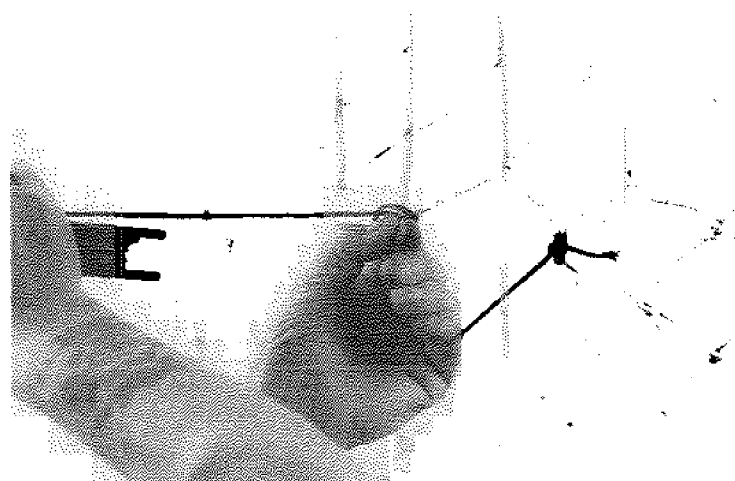
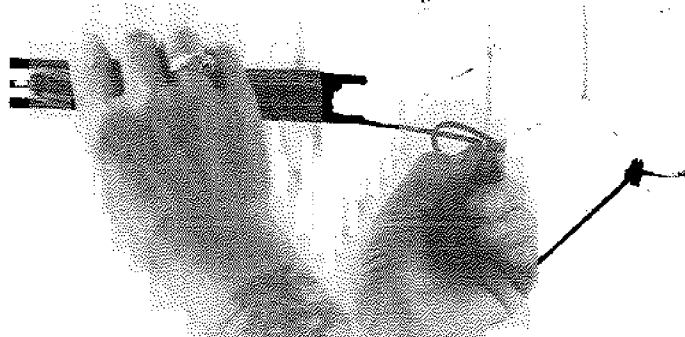


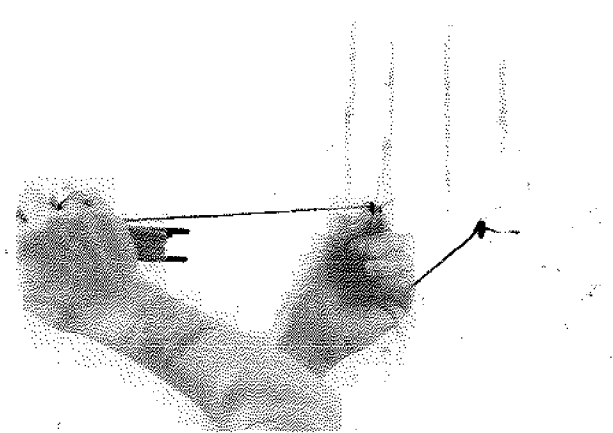
...followed by forefinger to grasp needle on other side.

Pickup Above Going Left (Continued)

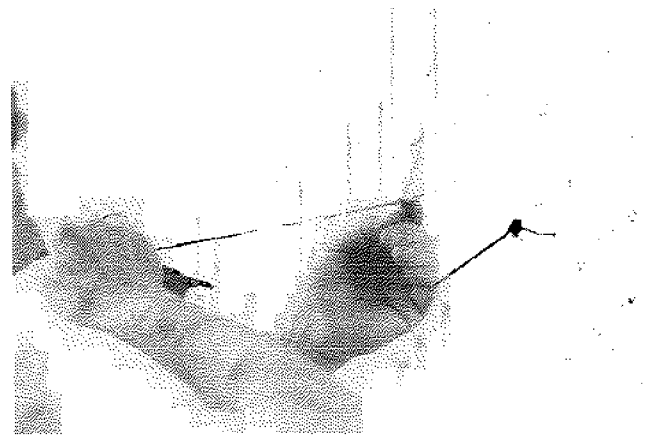


Hitch is drawn up.



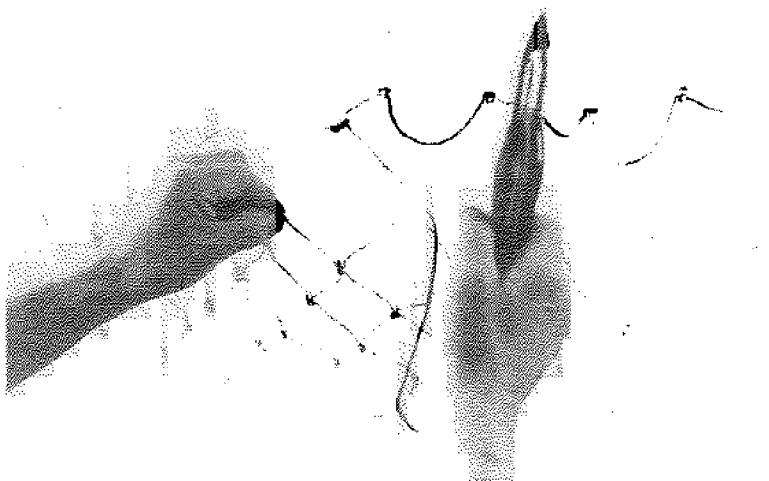
Pickup Above Going Left (Continued)

Hitch is drawn tight onto thumb and forefinger.

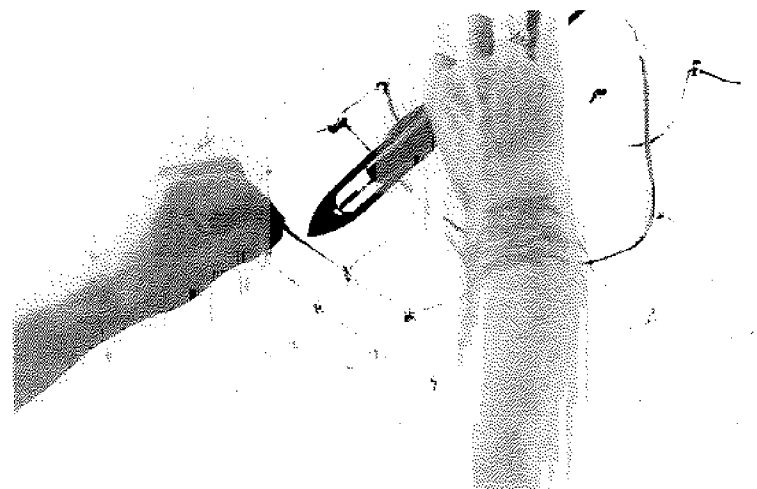


Knot is set by pulling firmly downward and to the left, with the mending twine pulling against the base of the tongue. If the needle were full, or a strong pull were called for, pull would be across the heel of the needle (as illustrated previously).

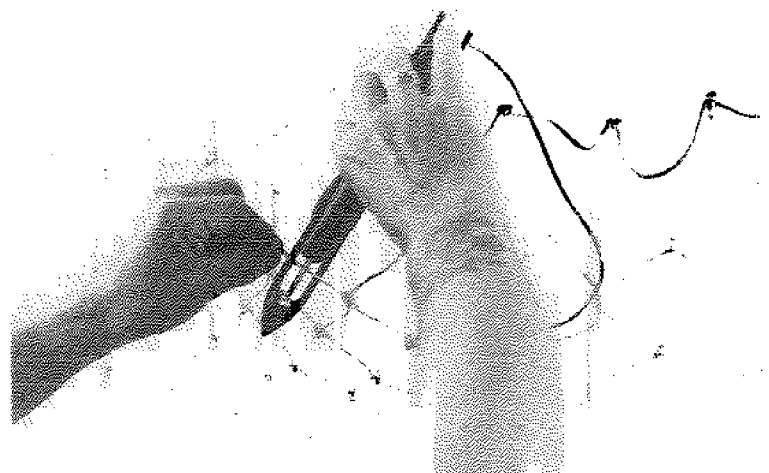
Pickup Below Going Right



Begin *pickup below going right*. Grasp with thumb and forefinger. Note needle held by its after end.

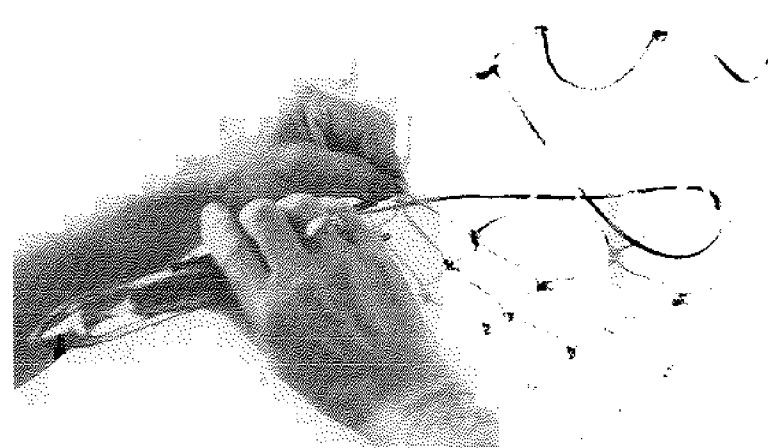
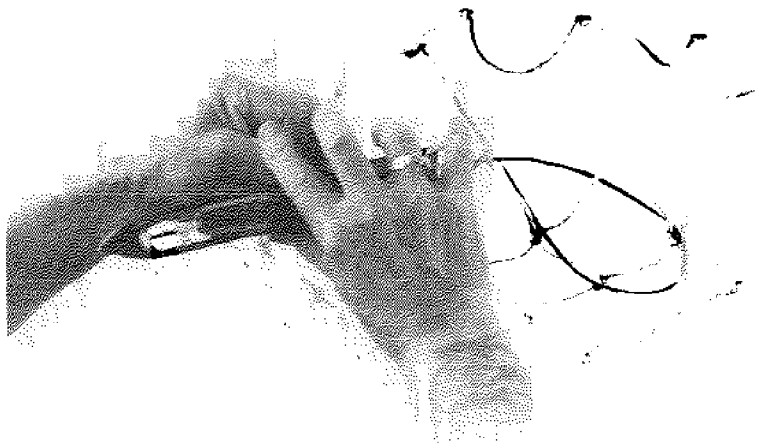


Begin to thrust needle through pickup.

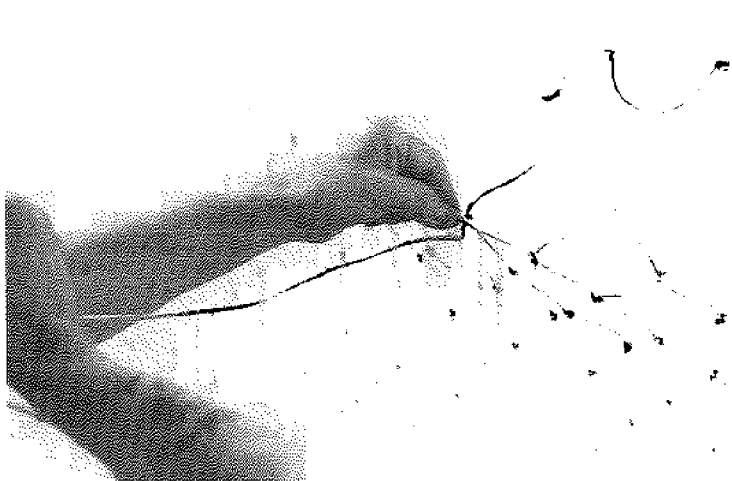


Right hand will now slide over pickup and catch needle on other side as needle passes through.

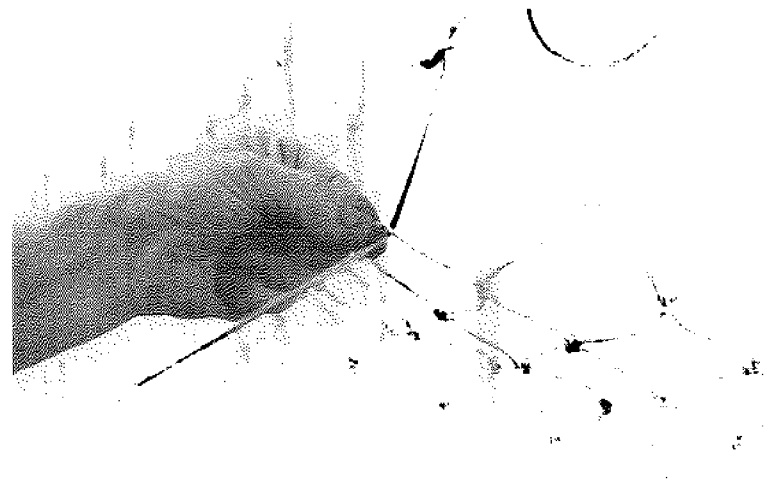
Pickup Below Going Right (Continued)



Twine will now be drawn through pickup...



...until half mesh is formed.



As mesh is formed, the mending twine is drawn in between thumb and forefinger.

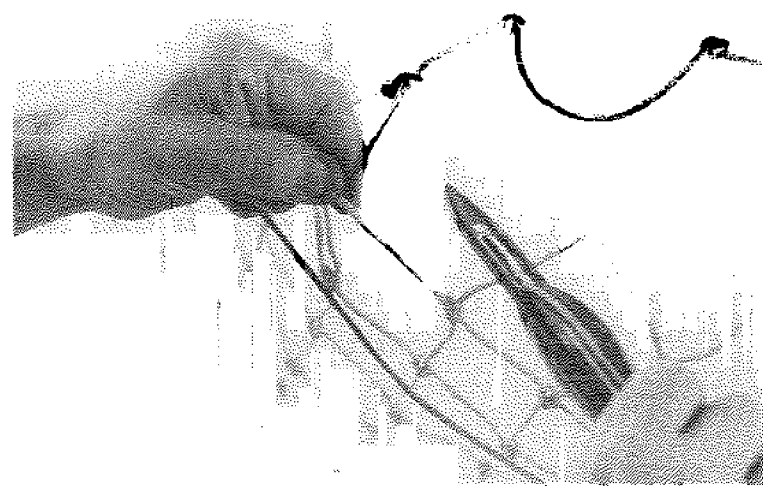
Pickup Below Going Right (Continued)



Mesh is now formed and held in place. Note three fingers reaching down to grasp mending twine.

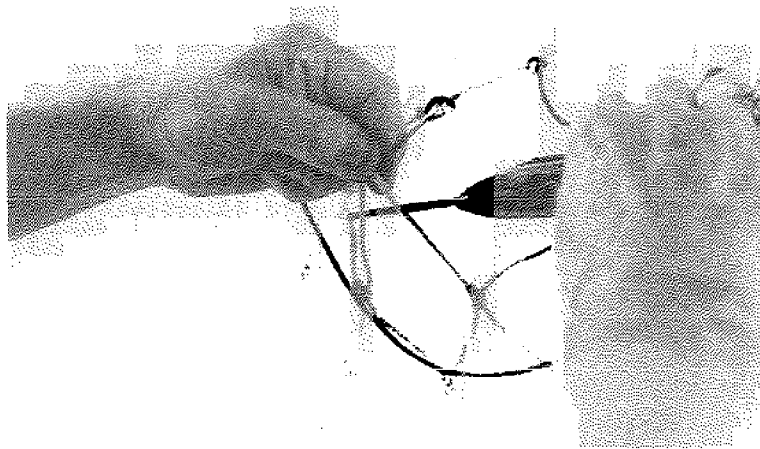


Fingers close to hold twine out of the way while final hitch is made.

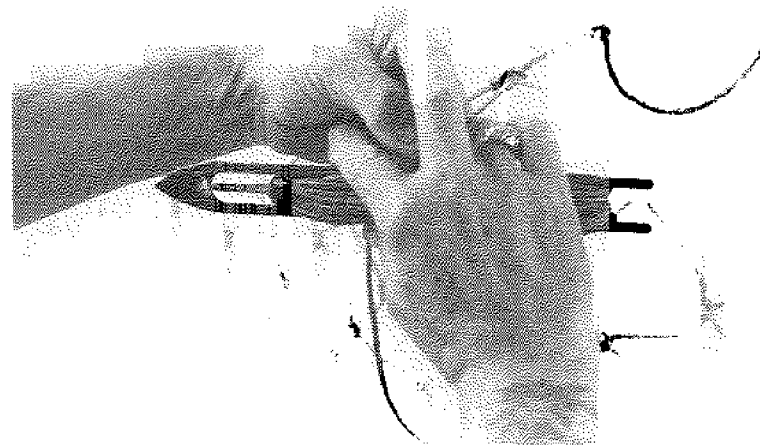
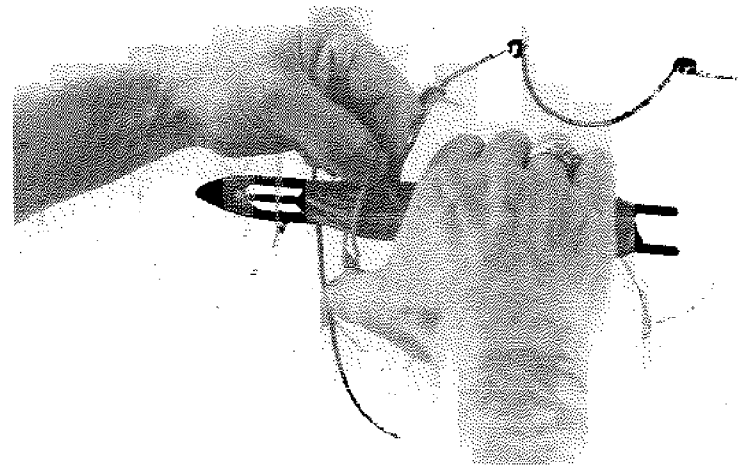


To form final hitch, needle is brought up and the point is thrust around and in back of original pickup.

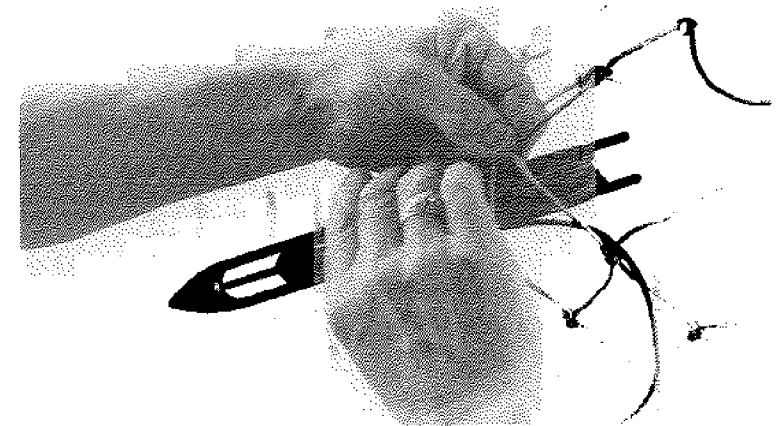
Pickup Below Going Right (Continued)



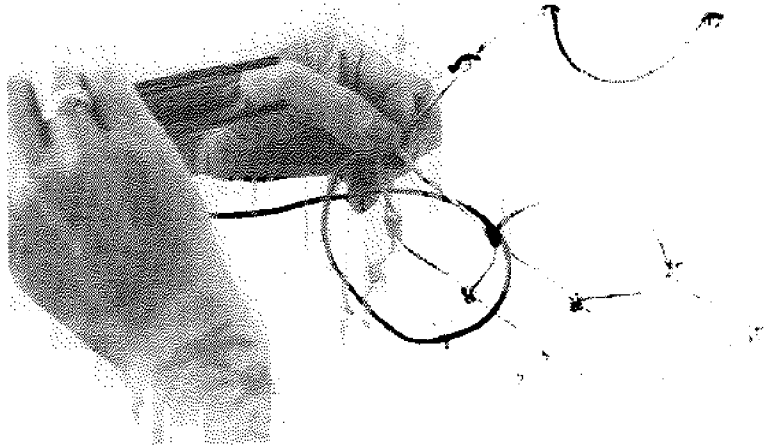
Needle will pass smoothly through behind pickup and in front of twine held in left hand.



Needle is caught by thumb and forefinger of right hand on other side of pickup as needle passes through.



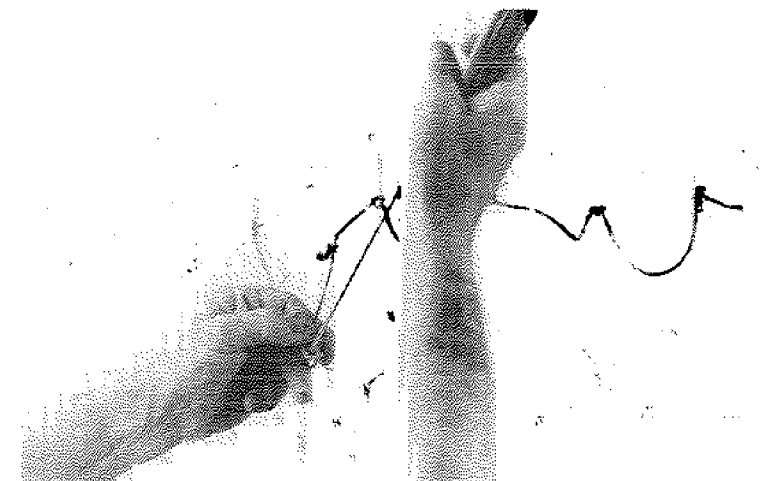
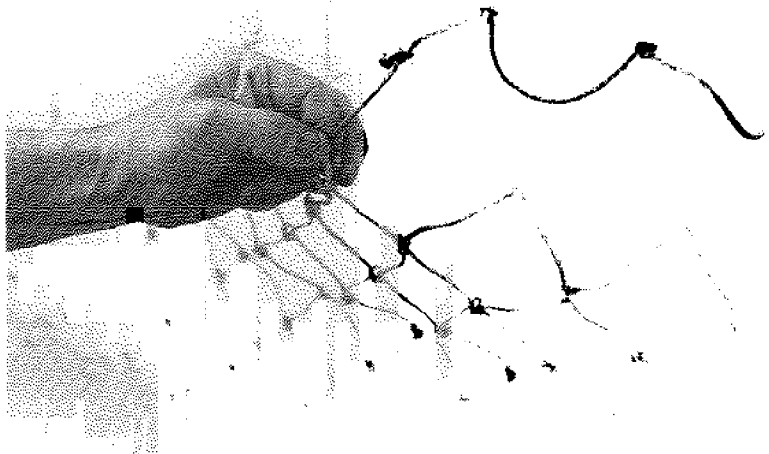
Pickup Below Going Right (Continued)



Hitch is now formed. Pickup and mending twine are still held tightly in left hand...

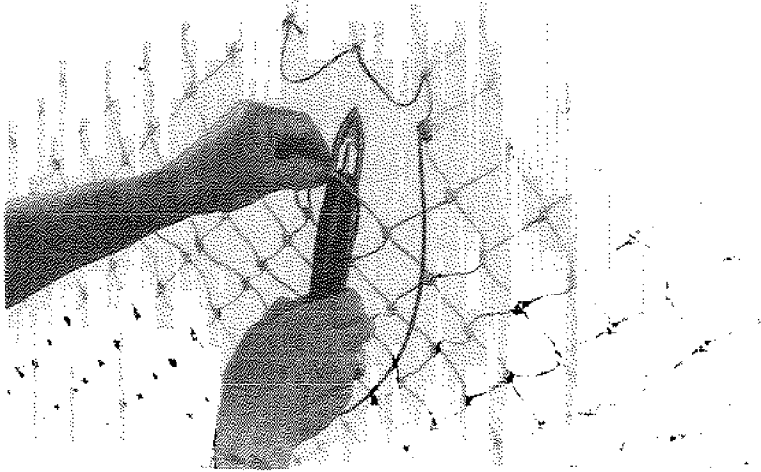


... as hitch is drawn up.

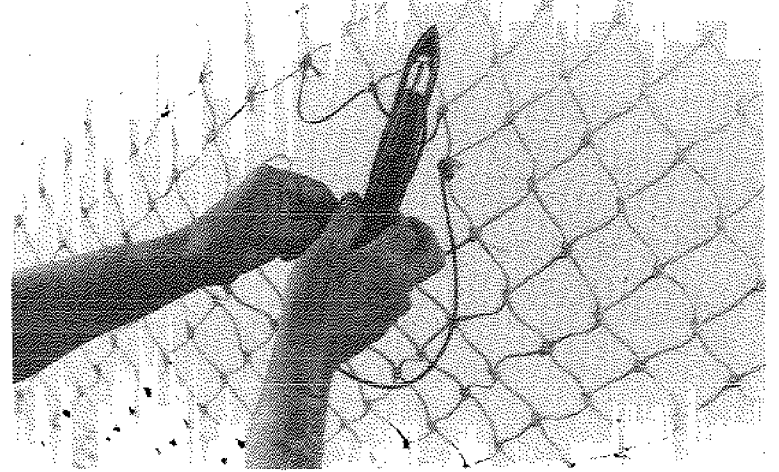


Hitch is tightened against thumb and forefinger. Knot is set by pulling hard upward with right hand and grasping original pickup with the left.

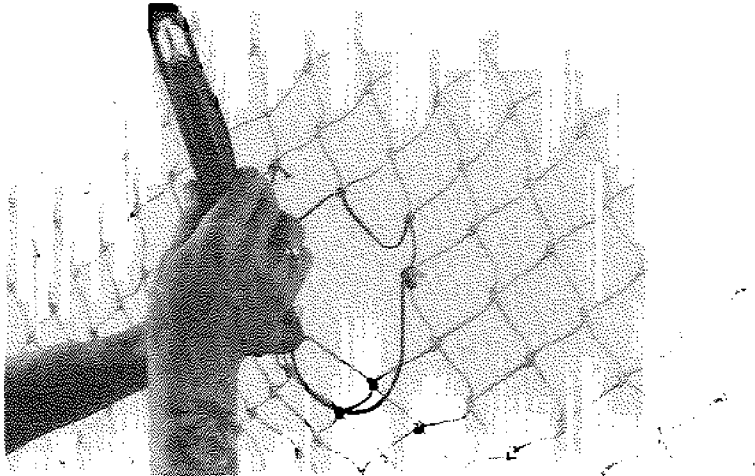
Pickup Below Going Left



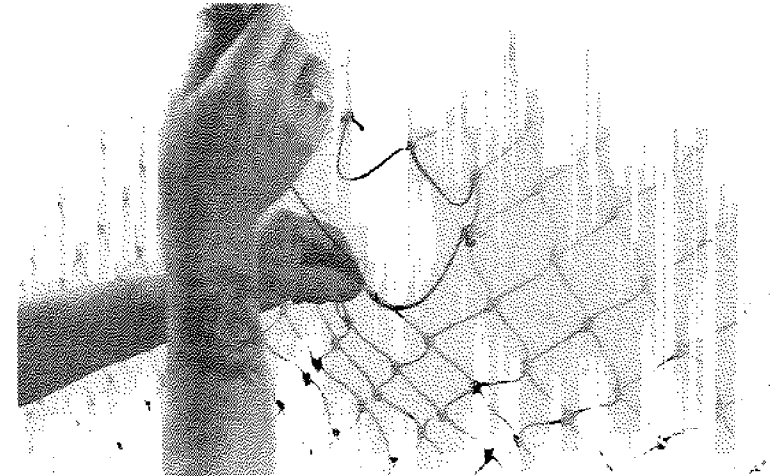
Begin *pickup below going left* by grasping mesh with thumb and forefinger. Note how needle is held by its after end. Needle is thrust through mesh...



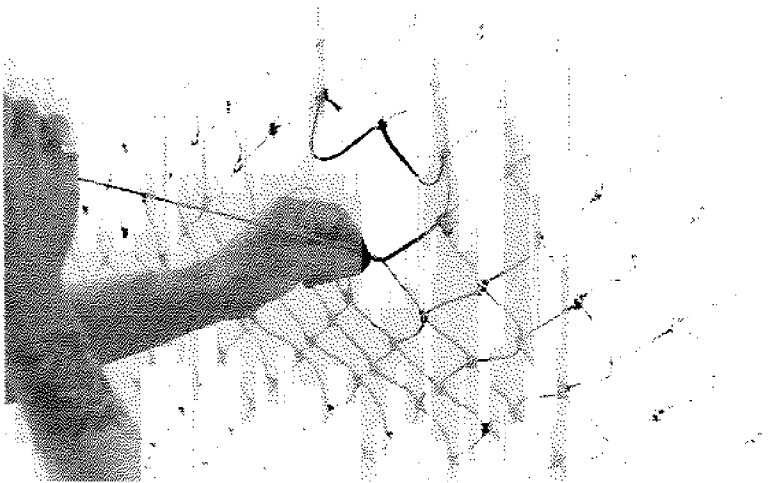
...to be caught by thumb and forefinger.



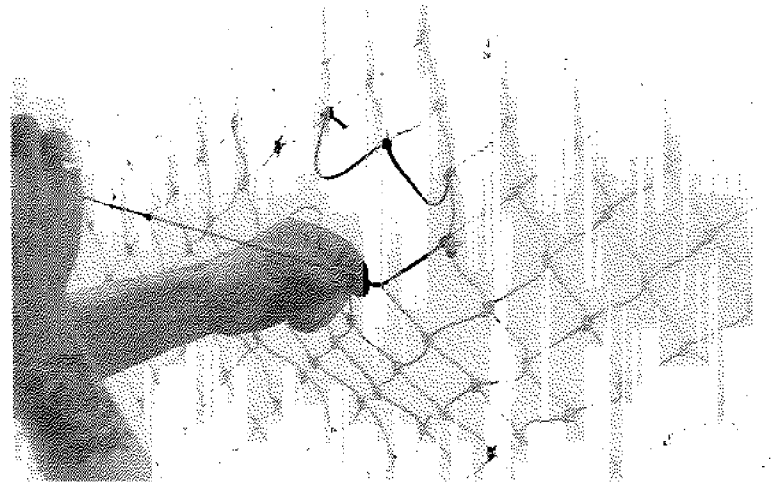
Twine is drawn through.



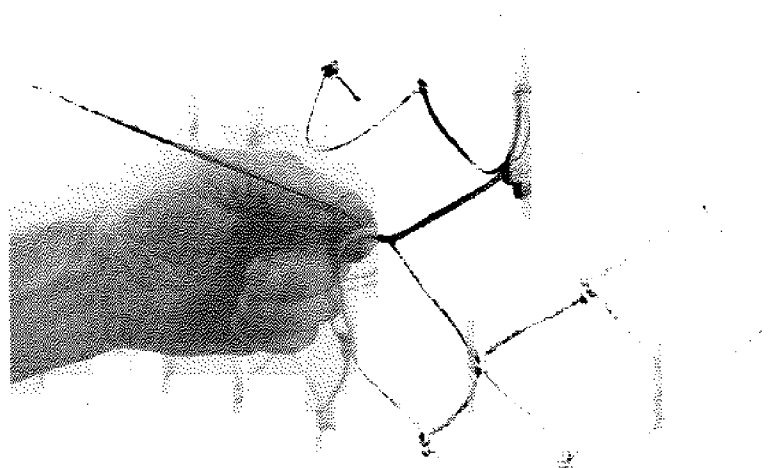
Pickup Below Going Left (Continued)



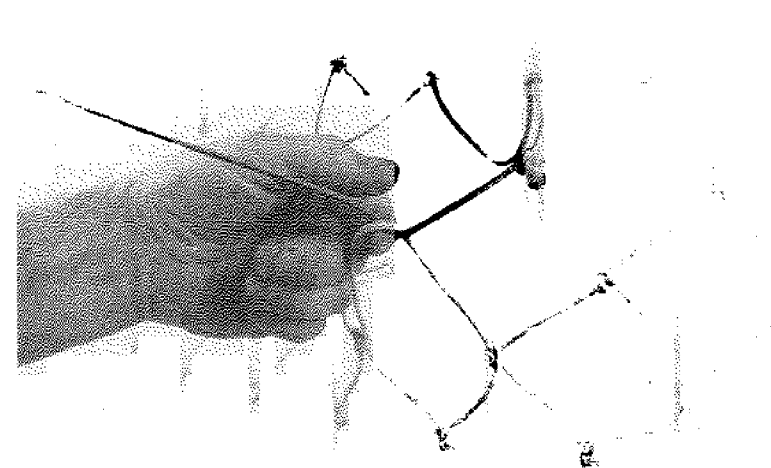
Twine is drawn up until new bar is properly formed.



Thumb is withdrawn from original position...

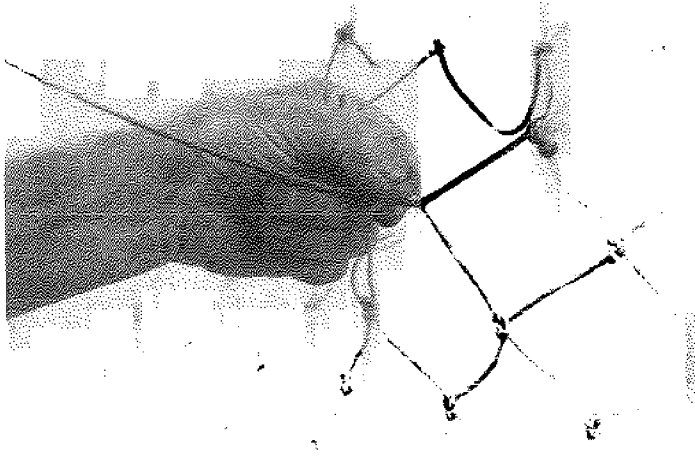


...and moves behind twine...



...to press down...

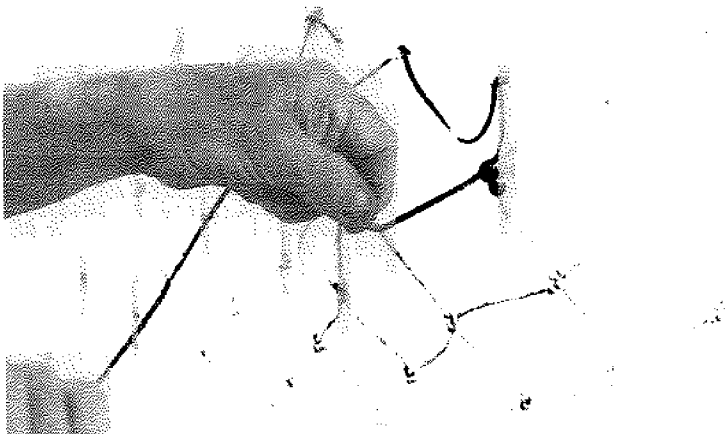
Pickup Below Going Left (Continued)



...and hold new overhand knot in position.



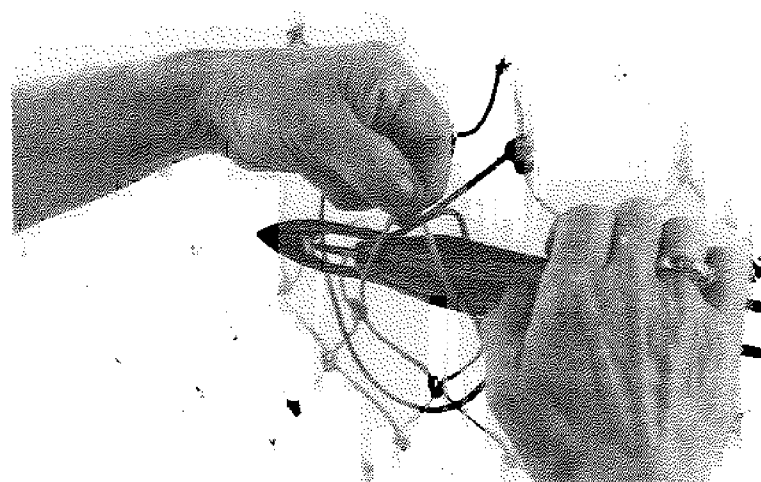
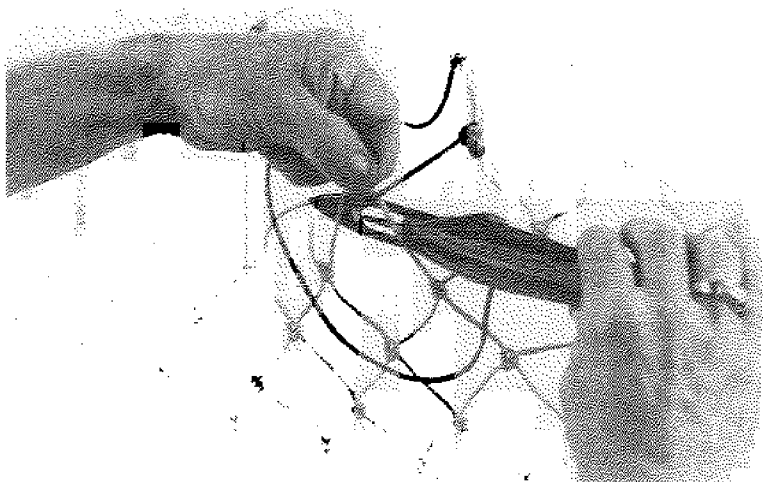
Last three fingers reach down...



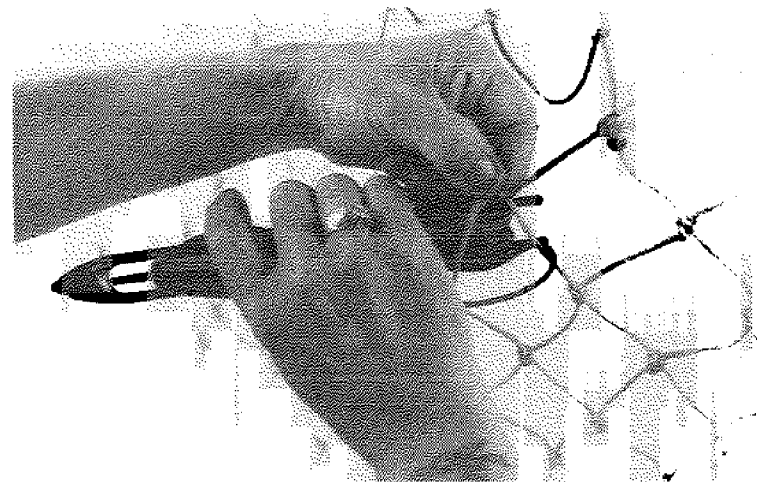
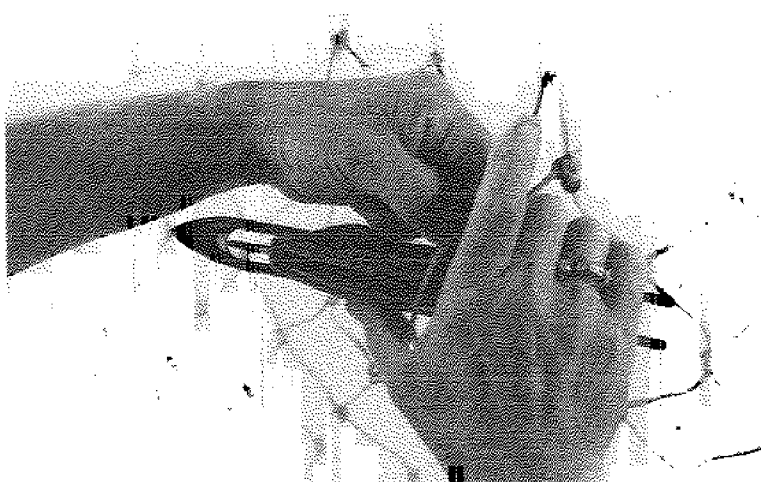
...and catch twine to hold it in a closed fist.



Needle will now be thrust behind original pickup.

Pickup Below Going Left (Continued)

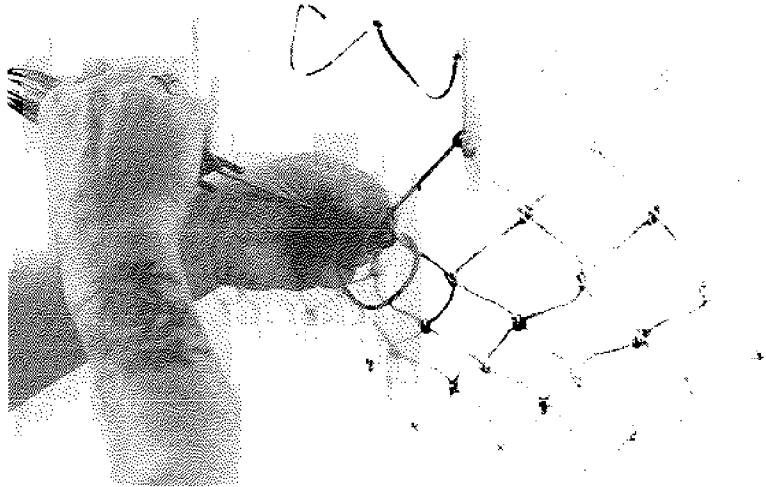
Twine held by left hand positions loop precisely to receive needle as it is thrust behind pickup.



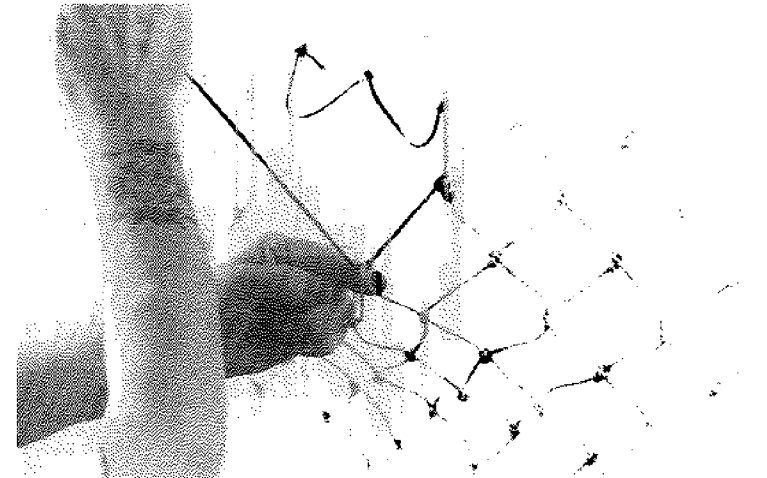
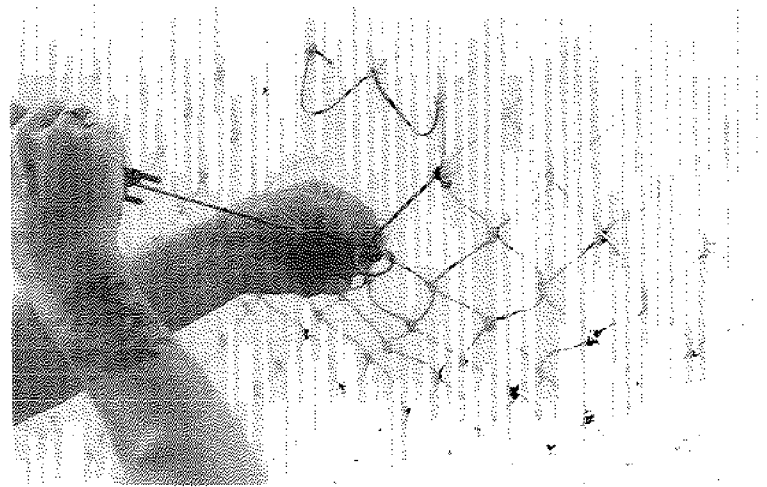
Thumb and forefinger lift to catch needle...

...as it slides through.

Pickup Below Going Left (Continued)

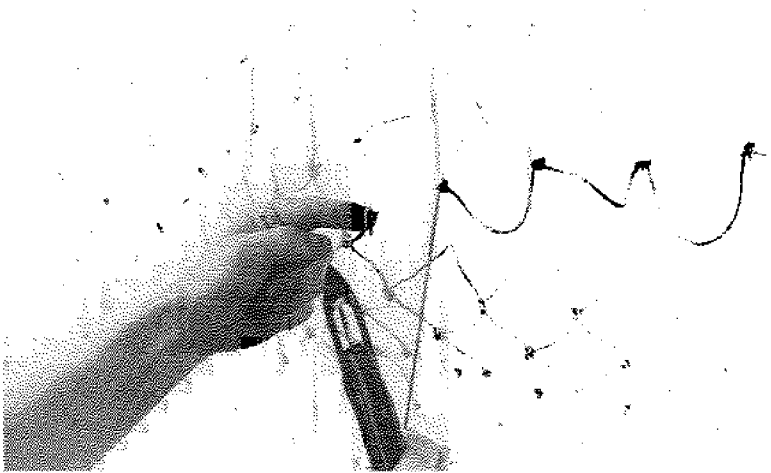


Hitch is drawn up.

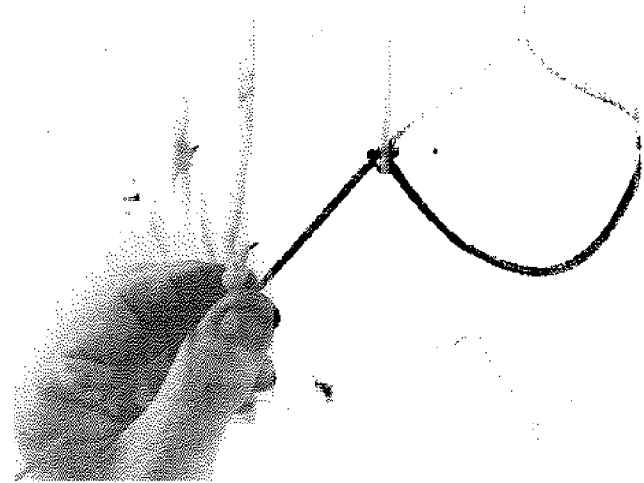


Thumb and forefinger are released at the last moment as knot is set up tight.

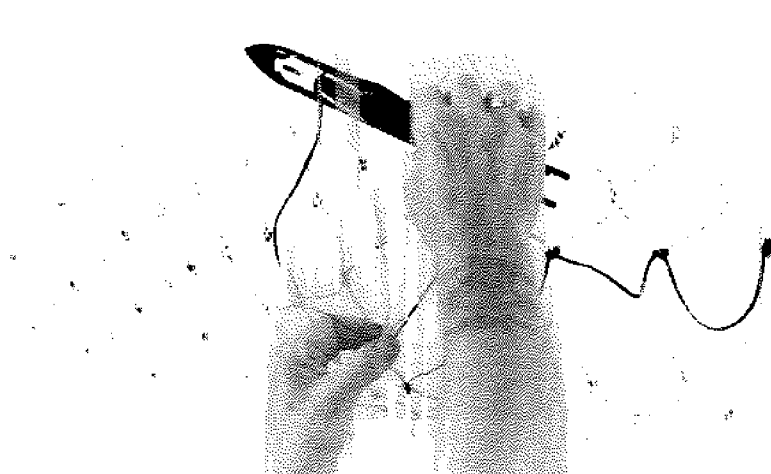
Sider on the Left



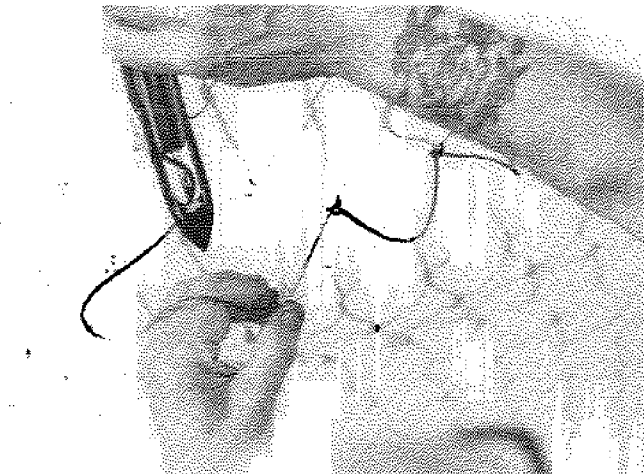
Begin *sider on the left*.



Hold mending twine against and in front of bottom of original knot by grasping both between thumb and forefinger.

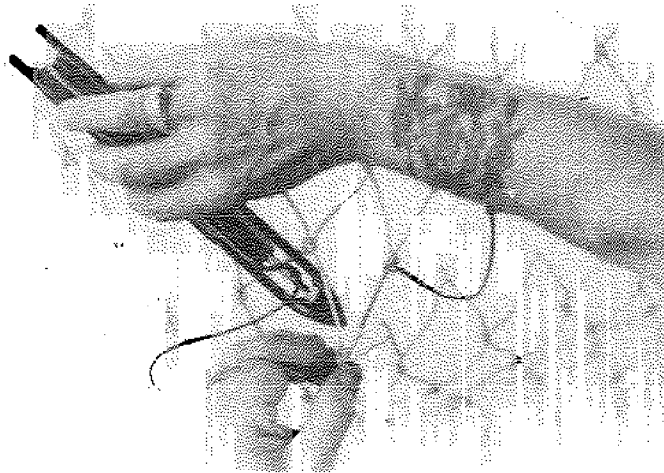


Raise needle...

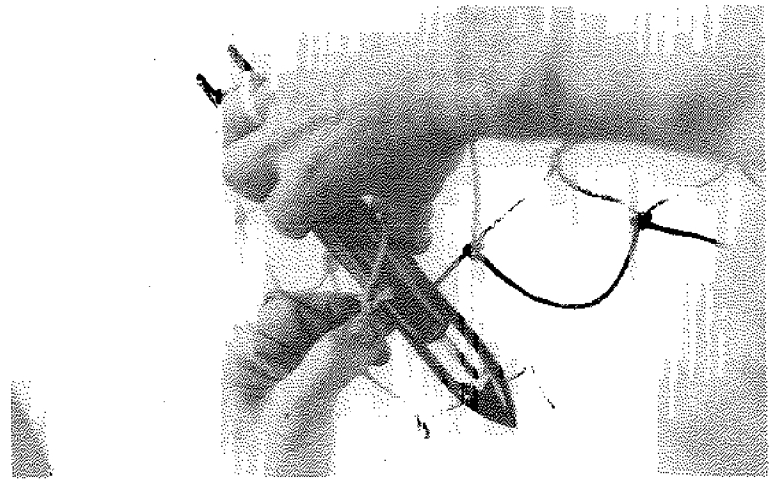
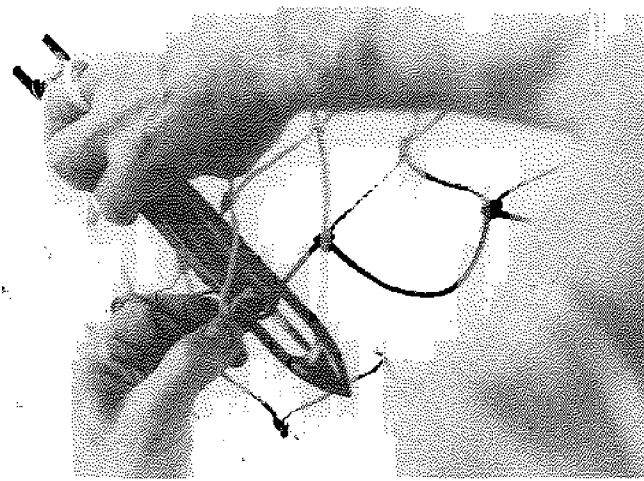
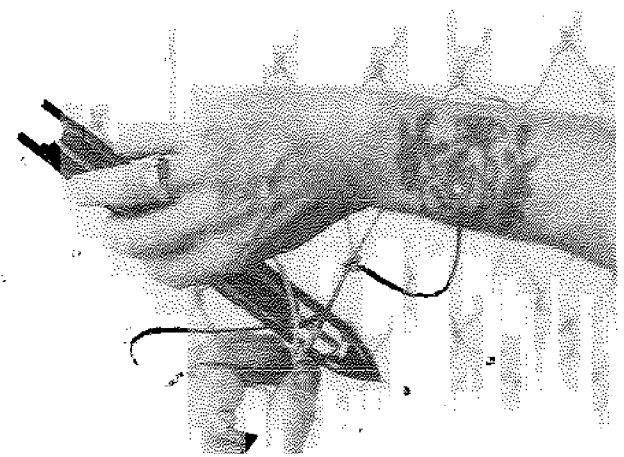


...and aim point toward knot.

Sider on the Left (Continued)

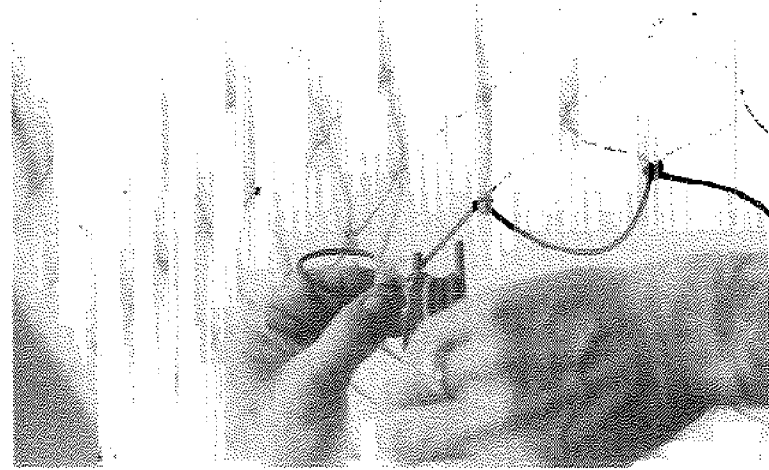
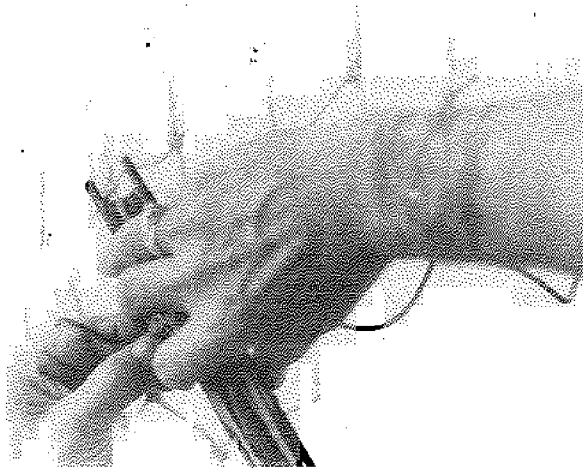


Pass needle behind original strand and in front of newly formed half mesh.

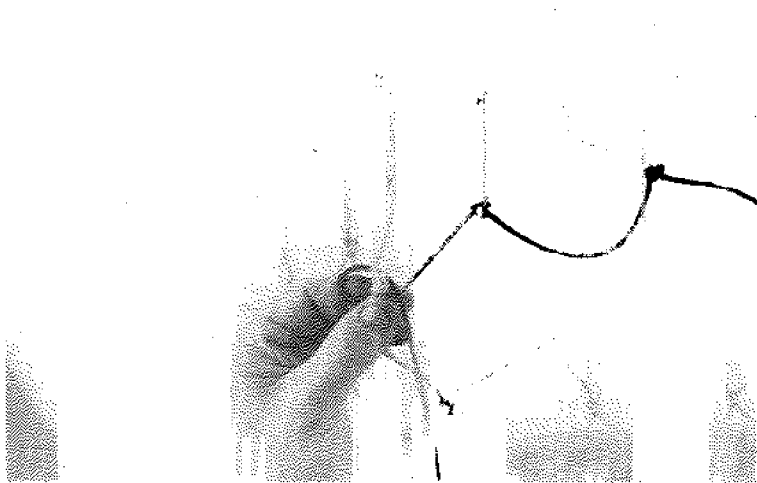


As needle passes through, thumb slides across original strand to help catch needle on the other side.

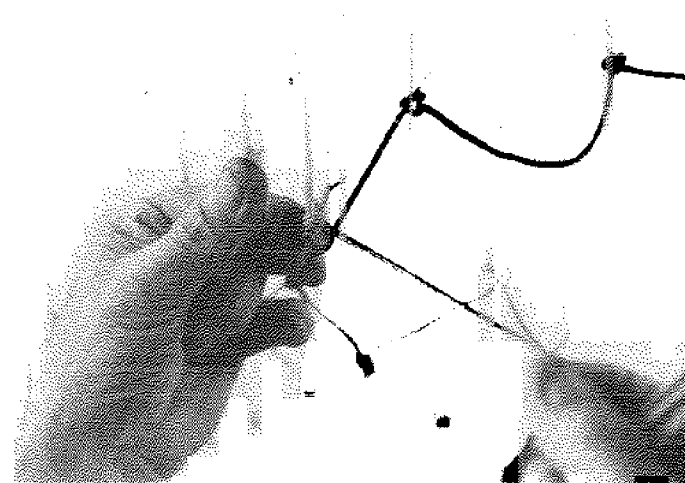
Sider on the Left (Continued)



Hitch is almost complete as needle clears knot.

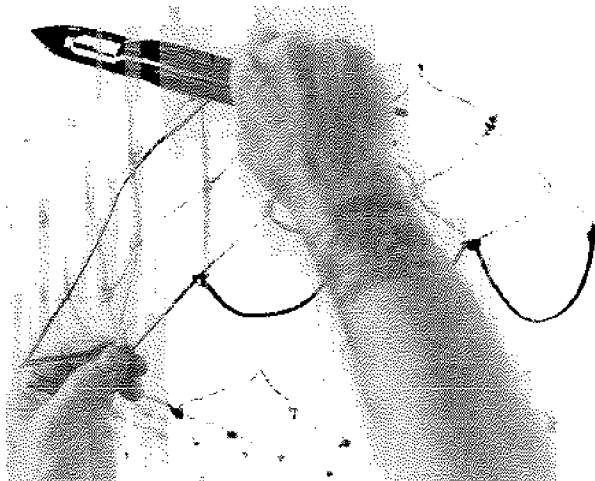


Hitch will be drawn up and held tightly between thumb and forefinger under original knot.

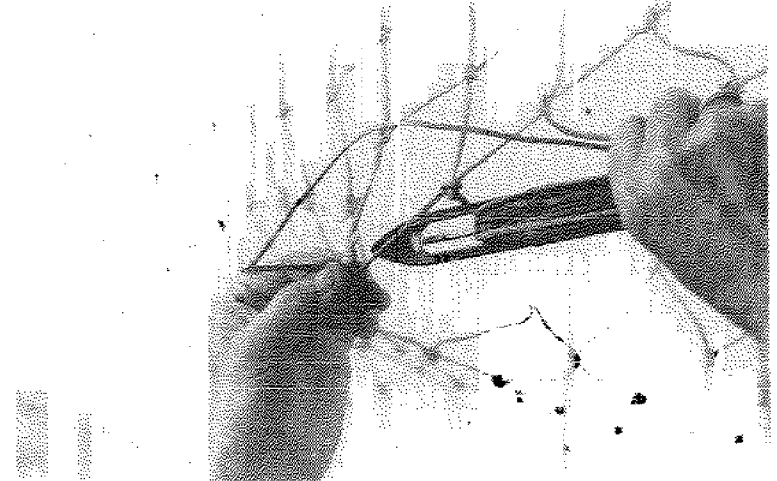


Normally, thumb remains closed on knot while next hitch is tied. This frame illustrates the completed first hitch.

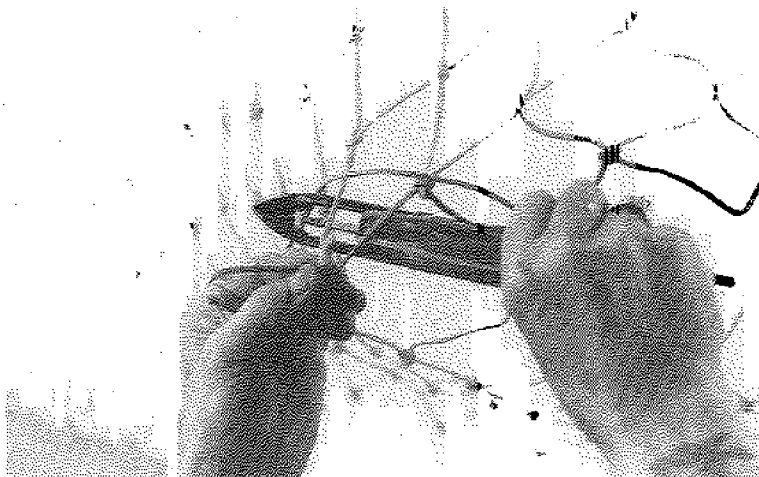
Sider on the Left (Continued)



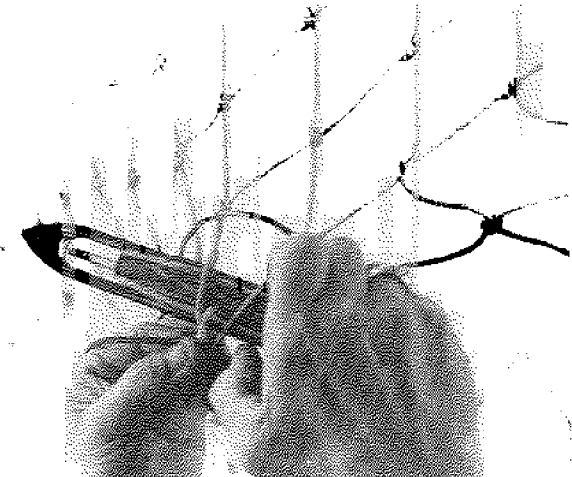
The needle is raised while left hand is sharply twisted. This produces a loop...



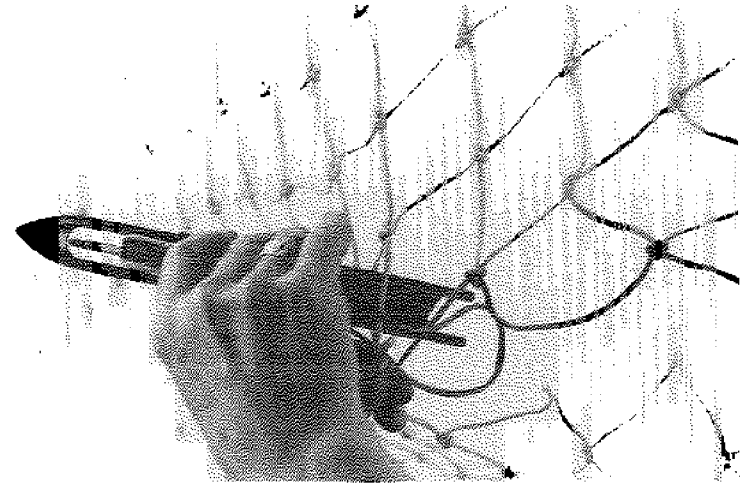
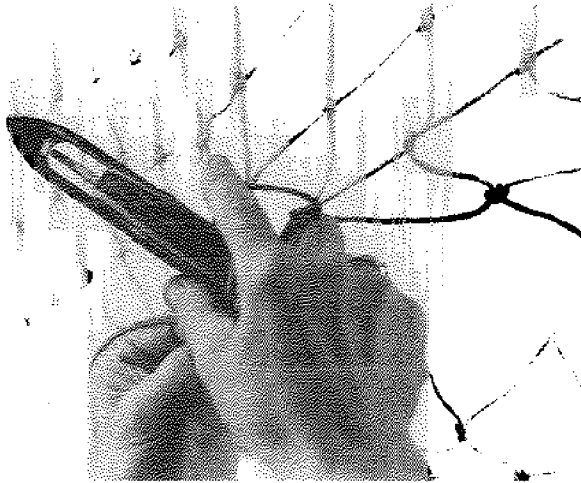
...which will be formed above the left hand and which will catch the needle...



...as it passes through behind both the new and the old strands.



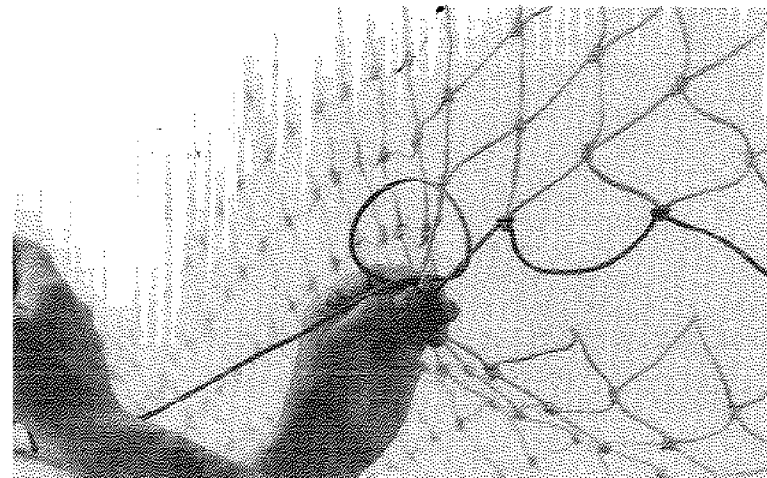
Right-hand thumb and forefinger are about to slide across mesh...

Slider on the Left (Continued)

...to catch needle as it passes through.

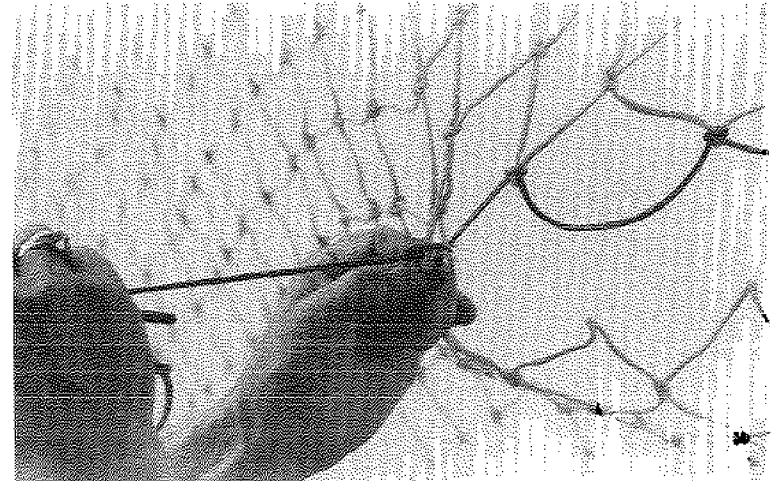
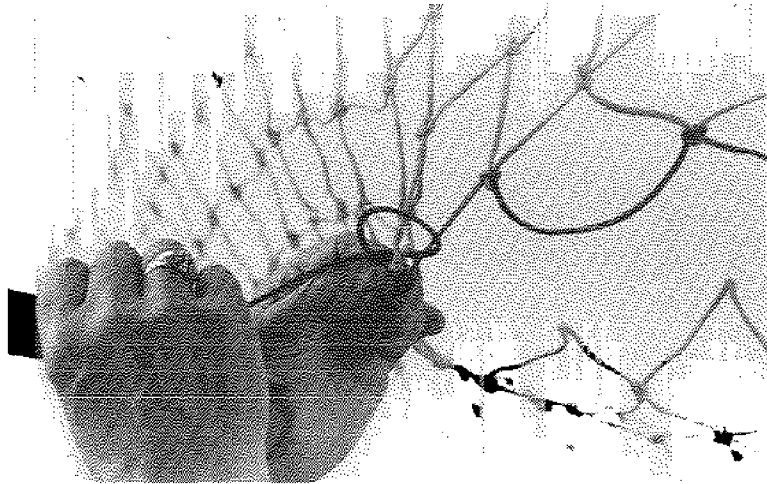


Hitch is now drawn up...

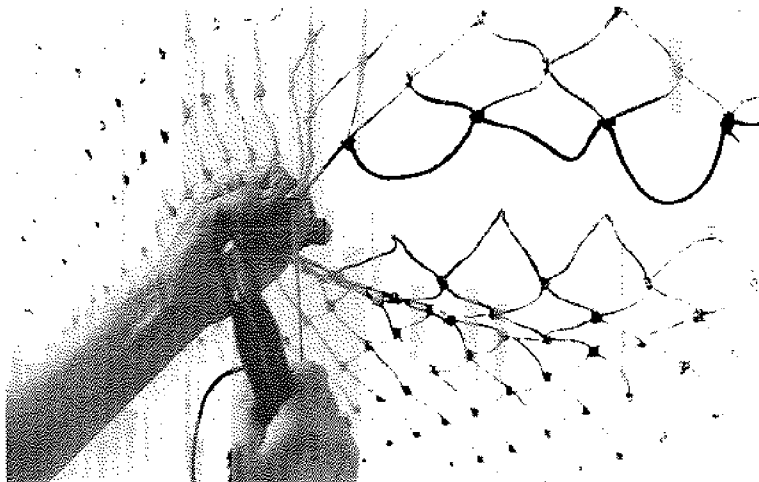


... and all the while thumb and forefinger firmly grasp the first hitch.

Sider on the Left (Continued)



Knot is completed by drawing up final hitch above original knot. Thus, original knot is held firmly above and below by individual hitches.

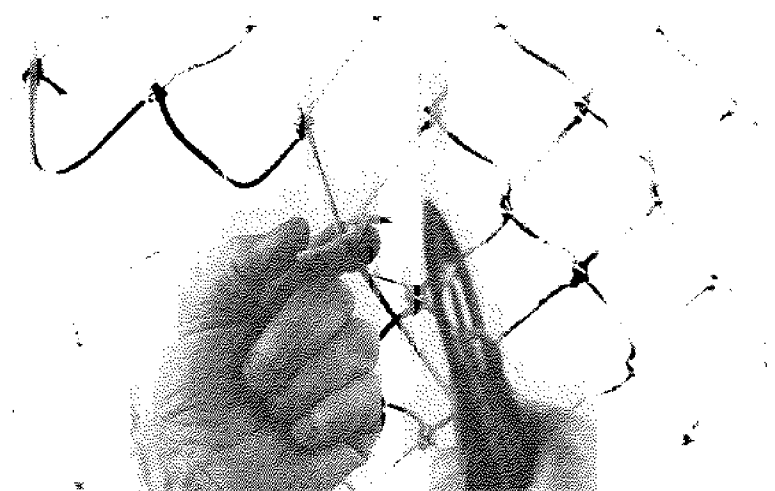


Knot is drawn tight by hauling downward.

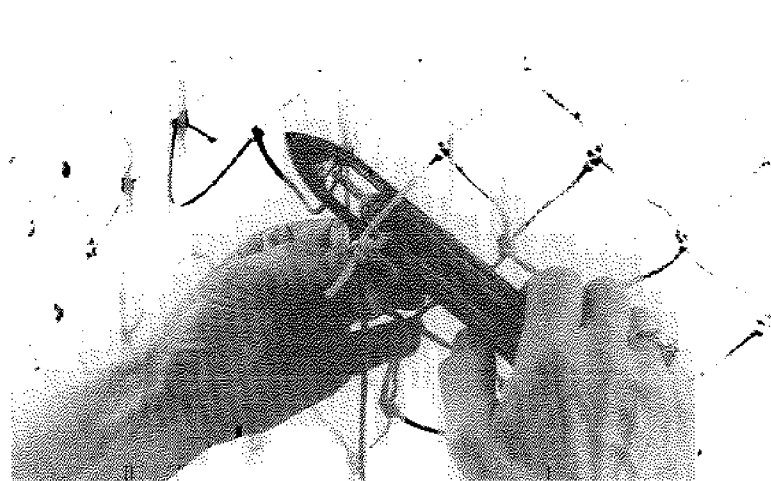
Sider on the Right



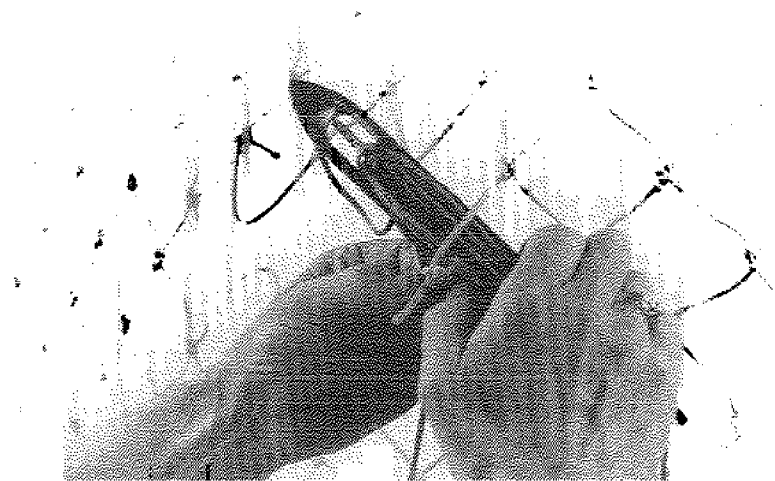
Begin sider on the right.



Move twine against bottom of knot and, after forming mesh, hold twine against bottom of knot between thumb and forefinger.

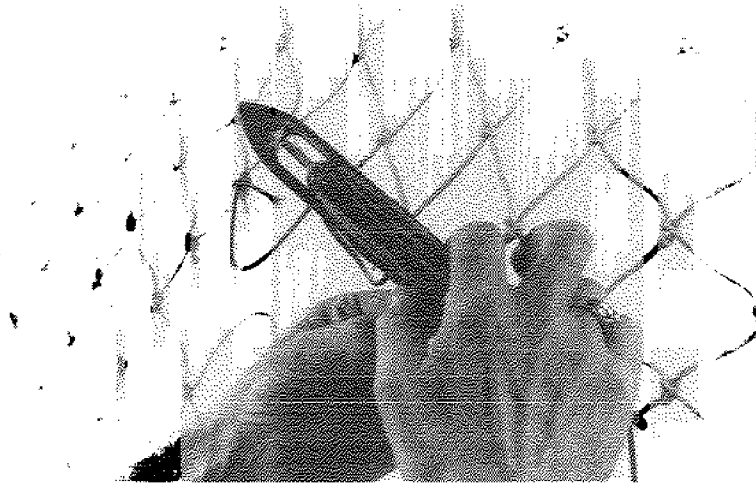


Pass needle through newly formed mesh from behind. Note how needle is held at its after end and not in the middle.

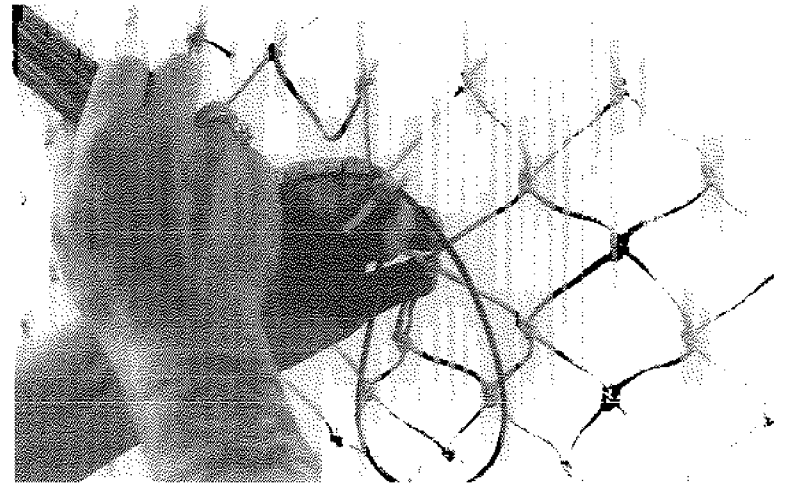


Right thumb is about to clear strand as needle passes through...

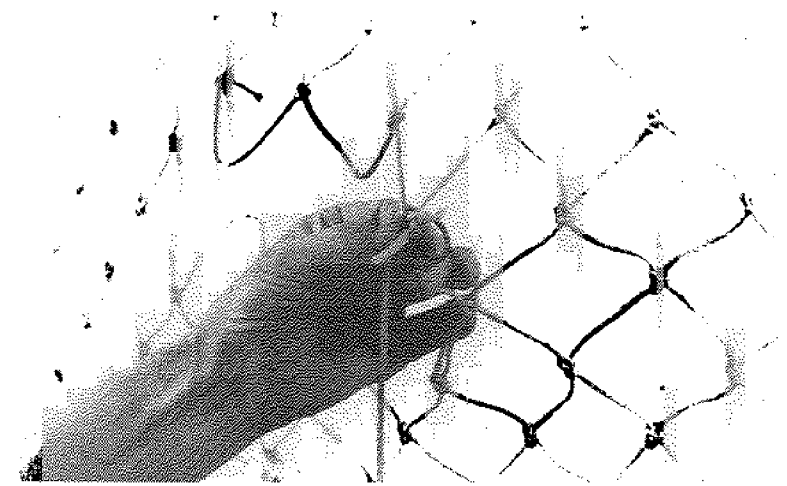
Sider on the Right (Continued)



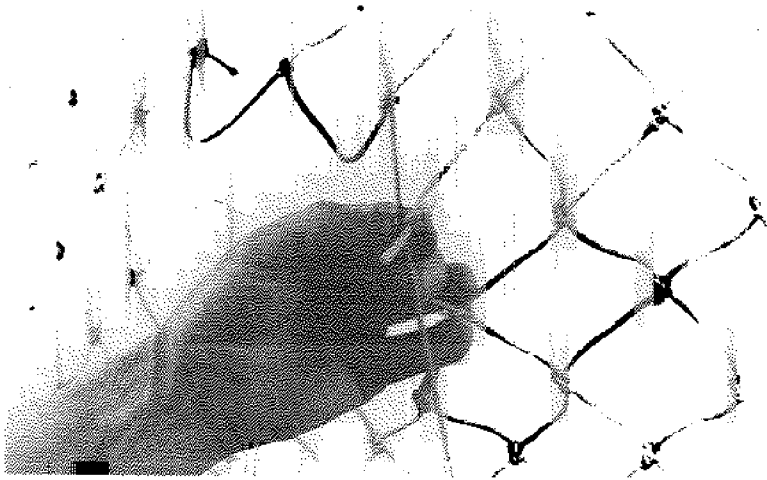
...to be caught by thumb and forefinger.



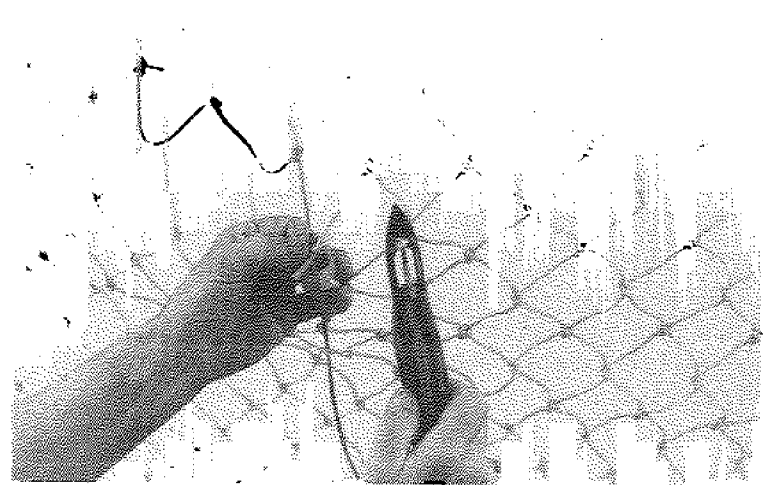
Begin drawing up twine to form hitch below existing knot.



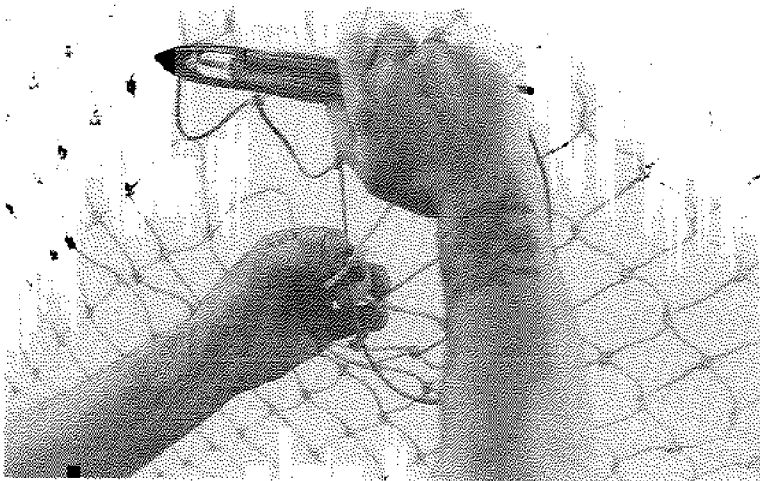
Sider on the Right (Continued)



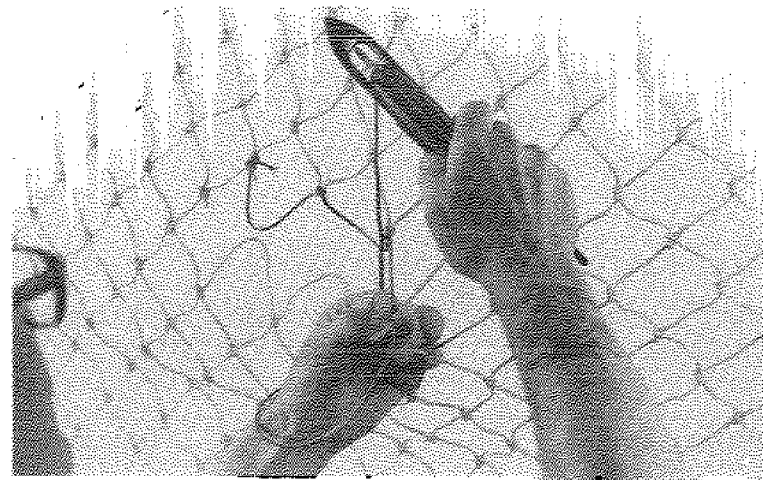
Hitch is drawn up and pulled between thumb and forefinger so that these fingers now firmly hold the new hitch.



The second hitch will now be tied above the original knot.

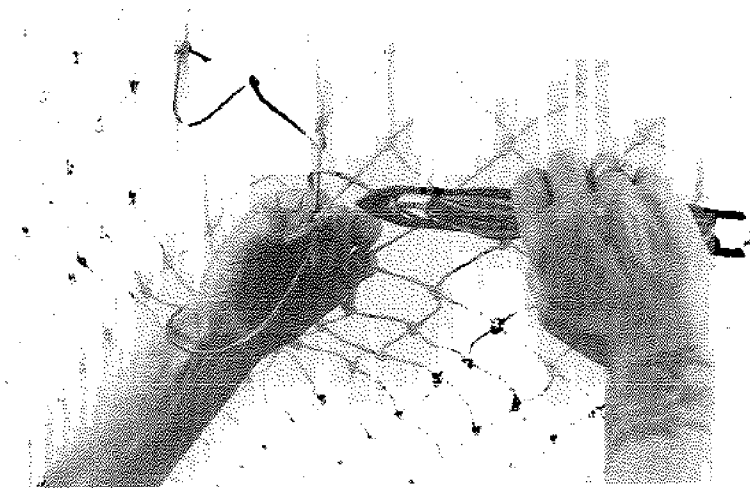


A combined motion of raising right hand and quickly twisting left hand...



...will flip twine to the left and make it lie loosely on top of left hand. The twine will now be in position to receive needle as it passes from right to left.

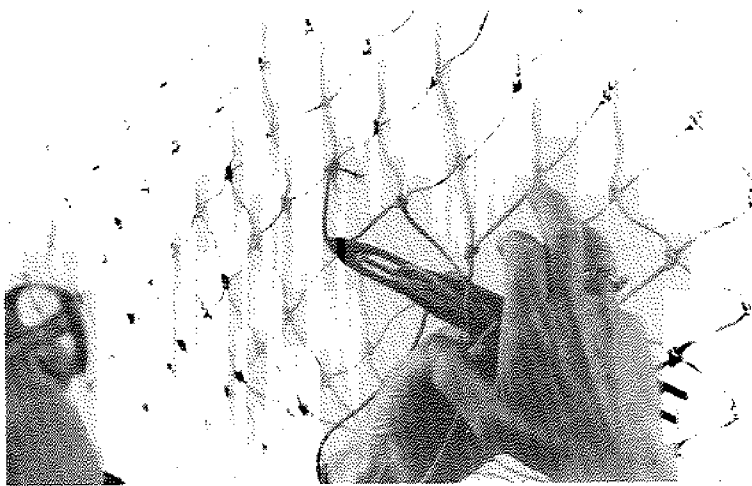
Sider on the Right (Continued)



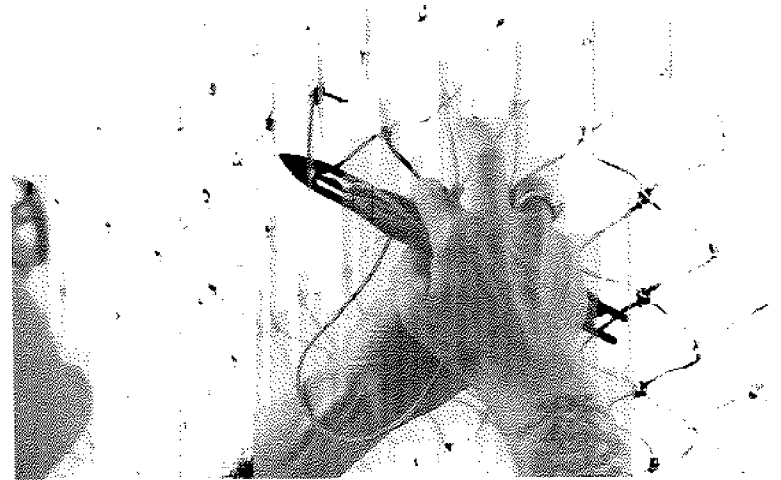
Needle is about to be thrust through...



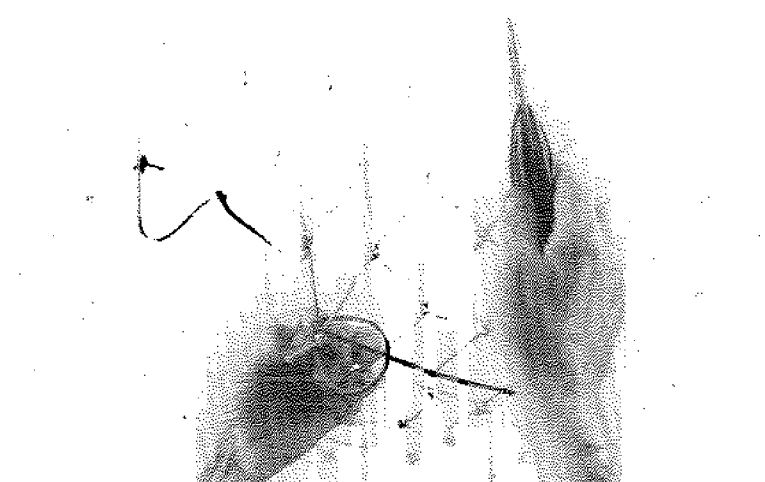
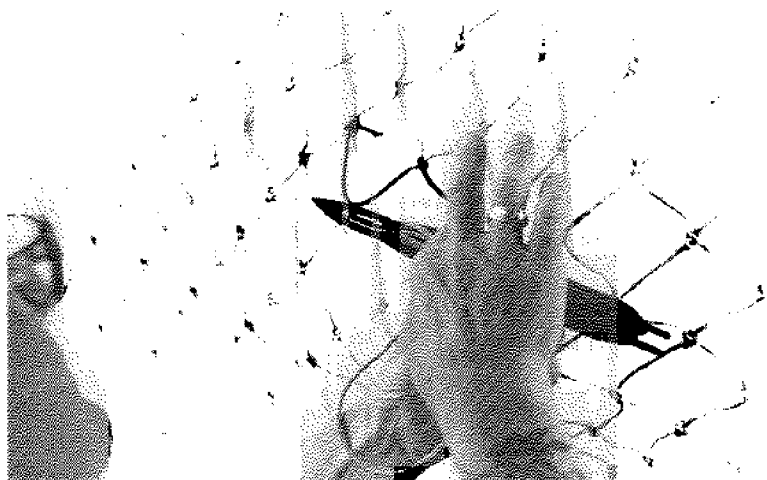
...and behind to form hitch from loop lying on left hand. Forming this loop will permit developing speed in mending.



Fingers open and slide over strands as needle passes through...

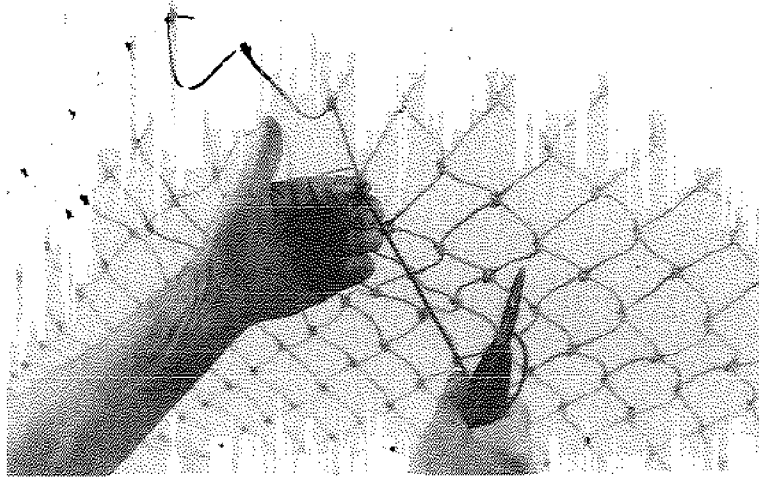


...to be caught on the other side.

Sider on the Right (Continued)

Final hitch is now drawn up.

Sider on the Right (Continued)



Knot is set by hauling downward and to the right.

