The Surgical Visual Field Enhancer Apparatus and Its Method of Use

The Surgical Visual Field Enhancer is used to improve the visual field under a limited skin incision. It includes various parts to make the surgeon's work easier, such as the removable handle, the tunnel opening guide, the tunnel dilator, the lighting tool and the lighting transmitter. Initially, the user holds the surgical tool body of the surgical visual field enhancer and uses the tunnel opening end to create a tunnel through the soft tissue. The tunnel opening end is composed of the tunnel opening tip and the enlargement scalpel for tunnel enlargement. The distance marker and guard are used for depth estimation, if some cases, the tunnel opening guide can be inserted in the soft tissue to guide the tunnel creation. The tunnel dilator will follow the tunnel opening guide to create the tunnel to the operative site. When the tunnel has been created, the visual enhancer end is inserted to enhance the surgical visual field. The surgeon can use a scalpel, scissors or other instrument as required passed through the tunnel created by the visual enhancer end. The associated lighting tool and lighting transmitter can be used as required to provide extra light on the surgical field.
The surgical visual field enhancer apparatus and its method of use

BACKGROUND OF THE INVENTION

The invention relates to a specialized instrument to enhance the visual field of a surgeon during a specific minimally invasive surgery procedure.

In modern surgery practice, it is preferred to use minimally invasive surgery when possible because of improved wound improvement, decreased wound infection, and a shorter recovery period. For example, a minimally invasive plates (MIPO) technique is now used worldwide in fractured bone fixation, because of rapid bone healing and less complications. However, minimally invasive surgery has some limitations in the visual field of the surgeon, necessitating the use of some blind techniques, which increase the risk of nerve transaction.

"The Carpal Tunnel Syndrome Release Operation" is one such new minimally invasive surgery technique, in which a small incision is made into the wrist in order to release the nerve. The old technique made a longer incision, which of course required a longer healing time. The new technique has a certain limitation, with a limited visual field, and we thought that it would be possible to design to alleviate this problem - and the result was the Surgical Visual Field Enhancer.

Our aim in designing this instrument was to provide for surgeons an instrument, which would enhance their visual field during the carpal tunnel release operation, others minimally invasive surgery, and reduce the risk of nerve damage resulting from a poor visual field.

SUMMARY OF THE INVENTION

The Surgical Visual Field Enhancer is used to improve the visual field under a limited skin incision. It includes various parts to make the surgeon's work easier, such as the removable handle, the tunnel opening guide, the tunnel dilator, the lighting tool and the lighting transmitter.

Initially, the user holds the surgical tool body of the surgical visual field enhancer and uses the tunnel opening end to create a tunnel through the soft tissue. The tunnel opening end is composed of the tunnel opening tip and the enlargement scalpel for tunnel enlargement. The distance marker and guard are used for depth estimation. In some cases, the tunnel opening guide can be inserted in the soft tissue to guide the tunnel creation. The tunnel dilator will follow the tunnel opening guide to create the tunnel to the operative site.
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References


BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an orientation views of all components of the surgical visual field enhancer apparatus, showing the removable handle, the tunnel opening guide, the tunnel dilator, the lighting tool and the lighting transmitter.

FIG. 2 is a view of the palmar side of the hand inserting the tunnel opening end to create the tunnel.

FIG. 3 shows the insertion of the visual enhancer end to increase the surgical visual field.

FIG. 4 illustrates the different lengths of tunnel opening neck, which are available, and the two kinds of guard.

FIG. 5 shows the different tunnel opening tip shapes available.

FIG. 6a shows the different kinds of the tunnel opening guides available.

FIG. 6b illustrates the tunnel opening guide with the surgical field enhancer.

FIG. 7 gives examples of the different kinds of guiding hole that can be made.
FIG. 8 shows the different kinds of visual enhancer end.

FIG. 9a shows the surgical field enhancer before attachment of the lighting tool.

FIG. 9b shows the attachment of the lighting tool to the surgical field enhancer.

FIG. 10a shows the surgical visual field enhancer before attachment of the lighting tool directly to the lighting transmitter's connector.

FIG. 10b shows the attachment of the lighting tool directly to the lighting transmitter's connector.

FIG. 11 are views of the different kinds of lighting transmitters which can be joined to the lighting tool.

FIG. 12a shows the attachment of the removable handle to the surgical field enhancer.

FIG. 12b showing how the removable handle is attached to the surgical field enhancer, insertion into a special slot.

FIG. 12c shows after attachment of the removable handle.

FIG. 12d another view after attachment of the removable handle to the visual enhancer end of the surgical field.

FIG. 13a and B: views of the tunnel opening end with a permanent handle.

COMPLETE DISCLOSURE OF INVENTION

Referring now to the drawings, and more particularly to FIG. 1, the medical apparatus is composed of six tools, a surgical visual field enhancer 10, removable handle 60, a 'tunnel opening' guide 50, tunnel dilator 95, lighting tool 70 and lighting transmitter 80. As shown in FIG. 2 and FIG. 3, the surgical visual field enhancer 10 is the main tool to use for the two steps of surgery, which are the tunnel creation process and the visual enhancement process. The other parts of this device are additional tools, which can be applied in certain situations that will increase the convenience of usage.

In FIG. 4, the surgical visual field enhancer 10 is diagramed, which has four major parts, the surgical tool body 11, the guard 20, the visual enhancer end 30 and the tunnel opening end 40. In the tunnel creation step, the tunnel opening end 40 is inserted into the soft tissue. The user holds the surgical tool body 11 with their thumb placed on the antigliding groove 12 for firm control during the tunnel creation process. The tunnel opening tip 41 is initially inserted, followed by the enlarging scalpel 45, which creates the tunnel by pushing the tool forward.

Still referring to FIG. 4, the tunnel opening end 40 has different sizes of tunnel opening neck 44. In cases where an extra long tunnel is needed, the long neck 441 is used, with the addition of a
guard 20 to monitor the tunnel depth. The adjustable guard 22 has an adjustable tunnel 24. The adjustable guard 22 slides on the tunnel opening long neck 441 to monitor and control the length of the tunnel using the length adjustable system. A distance marker 47 is calibrated on the tunnel opening device's neck 44 to allow accurate estimation of the depth of the tunnel.

In FIG. 5, the different shapes of the tunnel opening tip 41 are shown, which can be used in different types of soft tissues. The small tunnel opening 411 has a small flat tiny tip, which is suitable for use in softer tissues, while the arrow type tunnel opening 412 has a tiny tip and wider slope at the bilateral base, which is suitable for use in harder tissues. The vertical type tunnel opening 413 has a tiny vertical tip and wider slope at the bilateral base which is suitable for use in a limited vertical entrance.

In FIG. 6a, a tunnel opening guide 50 is an additional tool to guide the direction in the process of tunnel creation. For insertion in different types of soft tissues, different sizes and shapes of tunnel opening guide 50 are available. The tunnel opening guide-wired version 501 has a small round tiny wire that is suitable for harder tissues. The simple tunnel opening guide 502 is a flat small shape that is suitable for softened tissues. The antislip tunnel opening guide 503 is a small flat shape with an antislip handle 55 and deepened guard stopper 54 that is suitable for general tissues such as subcutaneous tissues. The tunnel opening guide 50 has two ends, one being a tunnel guide starter 53 and the other being the body of the tunnel opening guide 52. For the tunnel opener guide-wired version 501, there are two small ends, which are a tunnel guide starter-wired version 531 and the body of the tunnel opening guide-wired version 521. The tunnel guide starter 53 is the initial part to be inserted that can control direction easily. The user can grip the handle and push the tunnel guide starter 53 forward for a controlled distance limited by the deep guard stopper 54. The handle has two types simple handle 550 or antislip handle 55. The simple handle 550 has smooth surface that is suitable for softer tissues. The antislip handle 55 has rough surface that is suitable for harder tissues. After starting with tunnel guide starter 53, the user passes the body of the tunnel opening guide 52 through the guiding hole of the guard 21 and then the guiding hole of the neck 46 as shown in FIG. 6b. Then the body of the tunnel opening guide 52 is inserted in the soft tissue. Under guidance, the tunnel opening end 40 can then create a tunnel following the direction of the tunnel opening guide 50.

In FIG. 7, the different kinds of tunnel opening guide 50 suitable for insertion through different kinds of guiding holes of the neck 46 are shown. The standard type of guiding hole 461 has a big hole that is suitable for simple tunnel opening guide 502 and antislip tunnel opening guide 503.
The small type of guiding hole 462 makes a smaller round hole that is suitable for the small tunnel opening guide-wired version 501. The pin type of guiding hole 463 has the smallest round hole that is suitable for the smallest size of tunnel opening guide-wired version 501. The holeless surface 464 has no hole on the neck, which is suitable for cases that do not need to use the tunnel opening guide 50.

Referring to FIG. 1, the tunnel dilator 95 is an additional tool for dilating a tunnel before the visual enhancement process. The tunnel dilator 95 is composed of a blunting tip 951, bilateral sharpened edges 952 and a handle with a marker 953. The rounded blunting tip 951 is used for the initial insertion zone. The bilateral sharpened edges 952 have wider edges for enlarging the tunnel. The handle with a marker 953 is a handling stick that has a marker for estimating depth.

For the visual enhancement process, the visual enhancer end 30 is inserted into the soft tissue along the tunnel, which has been created by the tunnel opening 40. FIG. 8 shows the visual enhancer end 30, which consists of a small tip 37, a lateral soft tissue protector 35 and a visual space 36. The small tip 37 has a special small round end which is small enough for initial insertion, after which the bilateral plates of the lateral soft tissue protector 35 are passed through to protect the soft tissues. When the user passes the visual enhancer end 30 deeply through the soft tissues, a visual space 36 is created, a tunnel through which the user can see clearly along the way. The user can then pass other tools such as a surgical knife or scissors though the visual space 36. The visual space 36 can have different shapes and sizes depending on the depth and size of the tunnel. A large visual enhancer end 33 has a longer visual space 36 that can be used for deep tunnels. An extra large visual enhancer end 34 has the longest visual space 36 that is used for the deepest tunnels. The visual enhancer end 30 has a lighting slot 31, which is a special slot for inserting additional tools such as a lighting transmitter 80. In cases where the lighting transmitter 80 is not needed, a slot less surface 32 is available for the visual enhancer end 30.

In FIG. 9a and FIG. 9b, the surgical visual field enhancer 10 can be attached to a lighting tool 70 and lighting transmitter 80 via the surgical tool socket 79. The lighting tip 83 is a small transparent tool that can be passed through the lighting slot 31 for lighting the visual space 36. The surgical tool body 11 is inserted into the surgical tool socket 79. In FIG. 10a and FIG. 10b, a special transparent version of surgical visual field enhancer 10 has a lighting transmitter's for visual enhancing 85 can be joined directly to the lighting tool 70 for lighting the visual space 36.

FIG. 11: the lighting tool 70 is composed of a lighting box 78, a locking fin 71, a lighting button 72, an on-off switch 73, a lighting transmitter slot 76 and a surgical tool socket 79. The
lighting box 78 contains the power source 74 and lighting source 75. The lighting button 72 is a special button that is pressed to give light while the surgical tool body 11 is being used. In cases where the light is needed for a protracted period of time, the user can turn the light on and off with the switches 731 and 732. The lighting transmitter slot 76 is a special slot for joining the lighting transmitter's connector 81. The lighting transmitter 80 has many designs for transmitting light from the lighting resource 75. The lighting transmitter 80 is composed of a lighting transmitter connector 81, a lighting saver 82, a lighting tip 83 and a lighting surface 84. A lighting saver 82 is a kind of reflecting light material which covers or coats the lighting transmitter 80. A lighting surface 84 has differences kinds of surface pattern such as a cross lighting surface 841, a longitudinal lighting surface 842, a diamond shape lighting surface 843 and a random lighting surface 844.

FIG. 12a shows a removable handle 60, which is an additional tool for improving the holding power. In FIG. 12b, shows a handle slot 61, which is inserted the surgical visual field enhancer 10 inside firmly. In FIG. 12c and FIG. 12d, we see the surgical visual field enhancer 10 can have attached a removable handle 60 at either end for convenience in handling any sides, tunnel opening end 40 or the surgical visual field enhancer 10. In FIG. 13a and FIG. 13b, a surgical visual field enhancer 10 can also be designed to be fused with a permanently designed handle 90. There are a tunnel opening end with permanent designed handle 91 and a visual enhancer end with permanent designed handle 92.
Claims

1. A surgical apparatus for visual enhancement, comprising:
   a surgical visual field enhancer 10 to improve surgical visual field.
   a tunnel opening guide 50 to guide the direction.
   a removable handle 60 to assist in gripping the tool during use
   a lighting tool 70 when needed to add light to the surgical field
   a lighting transmitter 80 for directing the light to a particular area of the surgical field
   a tunnel dilator 95 to expand the created tunnel

2. The apparatus according to claim 1, wherein said surgical visual field enhancer 10 is composed of
   a visual enhancer end 30 and the surgical tool body 11.

3. The apparatus according to claim 1 or 2, wherein said surgical visual field enhancer 10 has a
   tunnel opening end 40 to create a tunnel.

4. The apparatus according to any claim of claims 1 to 3, wherein said surgical visual field enhancer
   10 has different sizes and shapes for proper use in different surgical fields.

5. The apparatus according to any claim of claims 1 to 4, wherein said surgical visual field enhancer
   10 has guard 20 use to limit the depth of tool insertion and assist in lifting the surgical tool body 11.

6. The apparatus according to claim 1 or 2, wherein said visual enhancer end 30 consists of:
   a small tip 37 having a small round tip which is proper for initial insertion,
   a lateral soft tissue protector 35 having fins for soft tissue protection.
   a visual space 36 having a hollow tunnel through which the procedure can be seen or tools passed

7. The apparatus according to any claim of the previous claims, wherein said lighting slot 31 is used
   for lighting the visual space 36

8. The apparatus according to any claim of the previous claims, wherein said tunnel opening end 40
   is used to create a tunnel through soft tissue and consists of:
   a tunnel opening tip 41 having a tiny tip which is proper for initial insertion of the tunnel
   opening end 40.
an enlargement scalpel 45 having two cutting rims for soft tissue dissection and tunnel enlargement.
a tunnel opening neck 44.

9. The apparatus according to any claim of the previous claims, wherein said tunnel opening neck 44 has a marker or number for estimating length.

10. The apparatus according to any claim of the previous claims, wherein said apparatus has a guiding hole 46 for inserting the tunnel opening guide 50.

11. The apparatus according to any claim of the previous claims, wherein said surgical visual field enhancer 10 has an antigliding groove 12.

12. The apparatus according to any claim of the previous claims, wherein said apparatus is attached to the tunnel opening end 40, which has different sizes.

13. The apparatus according to any claim of the previous claims, wherein said apparatus is attached to the visual enhancer end 30 with removable handle 60 or permanently attached handle 90.

14. The apparatus according to any claim of the previous claims, wherein said apparatus is attached to the tunnel opening end 40 with a removable handle 60 or permanently attached handle 90.

15. The apparatus according any claim of claims 1, 2 or 5, wherein said apparatus has a guard 20 for inserting the tool to the correct depth.

16. The apparatus according any claim of claims 1, 2, 5 or 15, wherein said apparatus has a guide hole 21 for assisting in following the correct direction of the tunnel opening guide 50.

17. The apparatus according any claim of claims 1, 2, 5, 15 or 16, wherein said guard 20 has a length adjustable system for creating the correct tunnel depth.

18. The apparatus according to any claim of the previous claims, wherein said tunnel opening guide 50 is an additional tool for directional guidance of the tunnel opening end 40 and tunnel opening guide 50 and consists of:
   a tunnel guide starter 53 having a small round hard tip for opening the initial track
   the body of the tunnel opening guide 52 having a long tiny shape to allow the guide to pass through the guiding hole 46.
19. The apparatus according to any claim of the previous claims, wherein said tunnel opening guide 50 has an antislip handle 55 for holding improvement.

20. The apparatus according to any claim of the previous claims, wherein said tunnel opening guide 50 has a deepened guard stopper 54 for proper deep insertion.

21. The apparatus according to any claim of the previous claims, wherein said removable handle 60 is an additional tool that may be attached to the apparatus firmly via a handle slot 61 for holding improvement.

22. The apparatus according to any claim of the previous claims, wherein said lighting tool 70 is used for lighting the surgical field and consists of:

   a lighting box 78 having a source of light and power inside.
   a lighting transmitter slot 76 having a socket for joining it to the lighting transmitter 80.
   locking fins 71 having thin bilateral plates for attaching to the surgical visual field enhancer 10 firmly.
   an on-off switch 73 for the light.

23. The apparatus according to claims 1 or 22, wherein said lighting tool 70 has lighting button 72 for partial lighting.

24. The apparatus according to claims 1 or 22, wherein said lighting transmitter 80 conduct light to visual space 36.

25. The apparatus according to any claim of claims 1, 22 or 24, wherein said lighting transmitter 80 is an additional tool which consists of:

   a lighting transmitter connector 81 having a connector which connects properly to the lighting transmitter slot 76.
   a lighting tip 83 to bring light to the visual space 36.
   a lighting surface 84 having different surface patterns for increasing brightness in the visual space 36.

26. The apparatus according to any claim of the previous claims, wherein said lighting saver 82 is selected from a group consisting of light reflecting material which covers or coats the lighting transmitter 80 for keeping and enhancing light to the lighting tip 83.
27. The apparatus according to any claim of the previous claims, wherein said tunnel dilator 95 is an additional tool for increasing the tunnel size, which consists of:
   a blunting tip 951 having a small blunt tip for initial insertion.
   a lateral edge 952 having a bilaterally enlarged curve for dissection and tunnel enlarging,
   a 953 long slim handle with a marker.

28. The apparatus according to claims 1 or 27, wherein said apparatus is composed of a tunnel dilator 95 which has different sizes and shapes for tunnel dilation.

29. The apparatus according to any claim of the previous claims, wherein said the material of construction is selected from the group consisting of stainless steel, aluminum, metal, polymer, plastic or transparent material.
Fig 1
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

INV. A61B/17/02
ADD. A61B17/00 A61B19/00 A61B17/32

According to International Patent Classification (IPC) or to both national classification and IPC.

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database consulted during the international search (name of database and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents:
  * "A" document defining the general state of the art which is not considered to be of particular relevance.
  * "E" earlier document but published on or after the international filing date.
  * "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified).
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T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention.

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone.

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

S document member of the same patent family.

Date of the actual completion of the international search

17 September 2010

Name and mailing address of the ISA:
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Date of mailing of the international search report

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