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(54) Title: POLYAXIAL MODULAR SKELETAL HOOK

(57) Abstract: A modular skeletal hook has an upper module for connecting with larger support apparatus to maintain bones of the skeleton in fixed relationship. The upper module is connected to an attachment module by a modified ball and socket arrangement. The attachment module has a C-shaped hook for engaging the bone. The angular orientation of the upper module and the attachment module may be fixed by a set screw threaded through the upper module and the attachment module.

POLYAXIAL MODULAR SKELETAL HOOK

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RELATED APPLICATIONS

This application is a continuation of Provisional Application 60/353,215 filed February 1, 2002.

FIELD OF THE INVENTION

This invention relates to the field of orthopedic surgery. Particularly, the invention is directed to skeletal fixation apparatus and implants having adjustable angular orientation between the bone attachment element and the rods or plates connected thereto.

BACKGROUND OF THE INVENTION

The purpose of the implant is to reinforce certain parts of the skeleton by use of strategically placed bone attachment devices. In some cases, these devices may support alignment support rods placed bilateral along the vertebrae as well as cross-link plates that bridge the spine.

Conventionally, pedicle screws are use to attach the implants to the bone. However, there are instances in which it is not desirable or possible to use screws. Other attachment devices, such as hooks, may be used when it is not desirable to penetrate the bone. Usually, these hooks or screws are rigid one piece constructions. Due to the various anomalies of the skeleton, occurring naturally or by trauma, it is difficult to place a series of attachments in such a manner that a uniformly shaped plate or rod can be connected without creating additional stress on the skeleton.

Further, in the case of the hooks there is the possibility of movement of the attachment point.

1 DESCRIPTION OF THE PRIOR ART

2 U. S. Patent No. 5,397,363 discloses a spinal
3 stabilization implant system using pedicle screws. Also
4 shown and described are hooks for attaching to the
5 vertebrae. These screws and hooks are one piece devices
6 without adjustment capabilities.

7 What is needed in the art is a bone attachment device
8 that may be optimally attached to the bone, as dictated by
9 the anatomy, with modular construction permitting changes in
10 angular orientation of a portion of the device for
11 connecting to support apparatus.

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14 SUMMARY OF THE INVENTION

15 A modular skeletal hook is disclosed having an upper
16 module for connecting to a larger support apparatus for
17 maintaining bones of the skeleton in fixed relationship.
18 The upper module is connected to an attachment module by a
19 modified ball and socket arrangement. The attachment module
20 has a C-shaped hook for engaging the bone. The angular
21 orientation of the upper module and the attachment module
22 may be fixed by a set screw threaded through the upper
23 module and the attachment module.

24 Accordingly, it is an objective of the instant
25 invention to teach a modular construction having a bone
26 attachment portion and a polyaxial support portion.

27 It is a further objective of the instant invention to
28 teach a bone hook formed with a ball socket with a threaded
29 aperture through the socket .

30 It is yet another objective of the instant invention to
31 teach a support module having a spherical area adapted to
32 fit into the socket of the bone hook. The spherical area
33 includes an aperture therethrough. Opposite the spherical
34 area, the support module has a threaded connector for
35 connecting to skeletal support devices.

1 It is a still further objective of the invention teach
2 a set screw which has multiple functions of connecting the
3 two major modules together, maintaining any angular
4 orientation between the modules, and positively attaching
5 the device to the bone.

6 Other objectives and advantages of this invention will
7 become apparent from the following description taken in
8 conjunction with the accompanying drawings wherein are set
9 forth, by way of illustration and example, certain
10 embodiments of this invention. The drawings constitute a
11 part of this specification and include exemplary embodiments
12 of the present invention and illustrate various objects and
13 features thereof.

14

15 BRIEF DESCRIPTION OF THE FIGURES

16 FIG. 1 is a side view of the polyaxial modular spinal
17 hook of this invention;

18 FIG. 2 is a top view of the ball socket module with
19 aperture;

20 FIG. 3 is a top view of the support module showing the
21 aperture;

22 FIG. 4 is a side view of the attachment module; and

23 FIG. 5 is a perspective of the set screw.

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25 DETAILED DESCRIPTION OF THE INVENTION

26 The modular polyaxial bone fixation device 10, shown in
27 FIG. 1, has an upper module 11 formed with a U-shaped
28 connector 12. The connector 12 has external threads 13
29 about the upstanding legs 14 and 15 for accepting a threaded
30 nut (not shown) to connect bone support apparatus between
31 the legs. A cross section of a spinal rod 16 is shown in
32 phantom lines. The bottom portion of the U-shaped connector
33 12 is shaped as a portion of a ball 17 or nearly spherical,
34 shown in FIG. 3. As shown, there is a flattened area 18.
35 The bottom portion 17 also has an aperture 19 therethrough.

1 The attachment module 20 has a socket portion 21, shown
2 in FIG. 2, shaped to accept the ball 17 of the connector
3 module 11. The upper edge of the socket portion 21 has
4 serrations 22 which act as stops for rotation when
5 assembled. The socket portion has an aperture 23 extending
6 through the thickened lower wall. The aperture has internal
7 threads 27 to cooperate with the threads 28 of the set screw
8 26.

9 Depending from the socket 21 is the C-shaped bone hook
10 25, shown in FIG. 4, which attaches to the skeletal bone of
11 a patient. The exterior and interior walls of the hook 25
12 are flattened for greater purchase on the bone. Aperture 23
13 penetrates the portion of the bone hook joined to the socket
14 21. The set screw 26, shown in FIG. 5, is threaded
15 through the upper module and the attachment module to
16 movably connect the two elements.

17 In use, the skeletal bone is exposed and an attachment
18 site is chosen. The hook 25 is attached to the bone. If a
19 series of the devices is necessary, the several separate
20 hooks are placed. The support modules of the several
21 devices are then brought into alignment for placing support
22 apparatus by manipulating the support module in the
23 attachment module. Once this alignment is established each
24 of the set screws in each of the modular sets are tightened
25 to fix the angular orientation of the support module to
26 accept another apparatus spanning the several modules. The
27 threaded set screw also contacts the bone within the arc of
28 the C-shaped hook to positively fix the device. The other
29 support apparatus is then placed in the aligned U-shaped
30 modules and the nut is threaded onto the U-shaped module to
31 secure the apparatus.

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1 It is to be understood that while a certain form of the
2 invention is illustrated, it is not to be limited to the
3 specific form or arrangement of parts herein described and
4 shown. It will be apparent to those skilled in the art that
5 various changes may be made without departing from the scope
6 of the invention and the invention is not to be considered
7 limited to what is shown and described in the specification
8 and drawings.

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CLAIMS

What is claimed is:

Claim 1. A modular polyaxial skeletal hook comprising a bone attachment module connected to an upper module through a polyaxial connection.

Claim 2. A modular polyaxial skeletal hook of claim 1 further comprising a socket portion formed on said bone attachment module and said upper module having a nearly spherical portion, said socket portion and said nearly spherical portion cooperating to form a modified ball joint for universal adjustment of said attachment module and said upper module.

Claim 3. A modular polyaxial skeletal hook of claim 2 further comprising an upper edge on said socket portion, serrations on said upper edge for engaging said nearly spherical portion.

Claim 4. A modular polyaxial skeletal hook of claim 2 further comprising an aperture through said nearly spherical portion, a set screw inserted in said aperture for fixing said upper module and said attachment module in a desired angular orientation.

1 Claim 5. A modular polyaxial skeletal hook of
2 claim 4 further comprising a second aperture in said
3 attachment module, said set screw traversing said second
4 aperture and adapted to engage a skeletal bone.

5

6 Claim 6. A modular polyaxial skeletal hook of
7 claim 5 further including screw threads in said second
8 aperture cooperating with said set screw.

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10 Claim 7. A modular polyaxial skeletal hook of
11 claim 3 further comprising said attachment module having a
12 member for engaging the skeletal bone, said member in the
13 formed in a generally C-shaped configuration.

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15 Claim 8. A modular polyaxial skeletal hook of
16 claim 2 further comprising said upper module formed in a U-
17 shaped configuration with a nearly spherical portion
18 connecting upstanding legs, said legs adapted to seat a bone
19 support apparatus between said legs, said legs having
20 interrupted screw threads about the free ends, said screw
21 threads adapted to cooperate with a threaded nut.

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23 Claim 9. A modular skeletal hook of claim 8
24 further comprising said nearly spherical portion including
25 a flattened area in contact with said socket.

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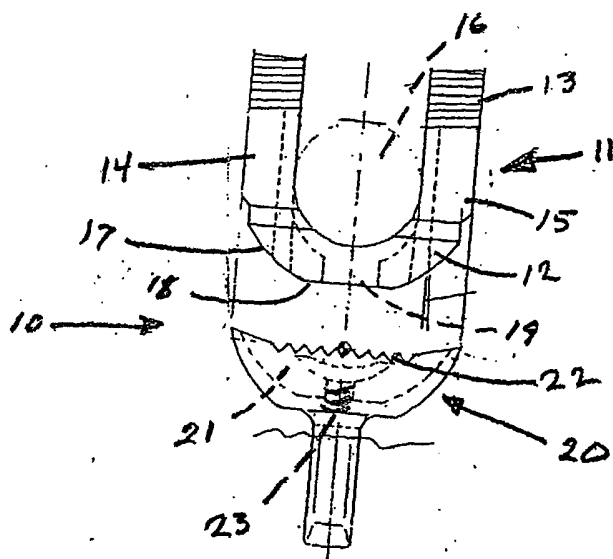


FIG. 1

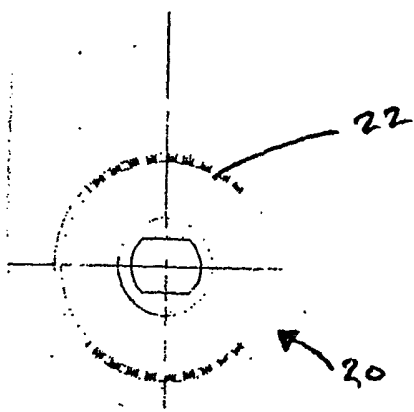


FIG. 2

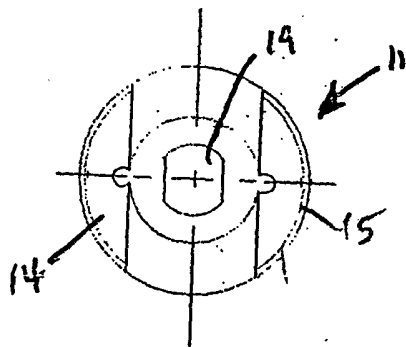


FIG. 3

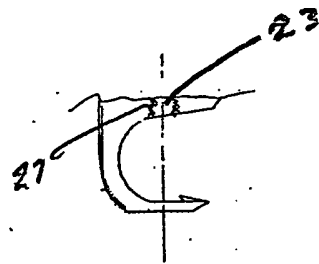


FIG. 4

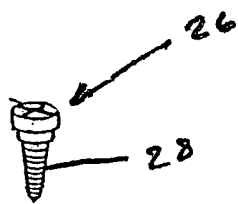


FIG. 5