Abstract Title: Lead for use in orthopaedic surgery

The lead comprises a length of wire formed with at least one channel extending longitudinally along its outer surface. Normally, a plurality of channels are provided each of which will preferably extend parallel to the wire axis. The lead can be used as a guide wire for a reamer.
LEADS FOR USE IN ORTHOPAEDIC SURGERY

This invention relates to orthopaedic surgery and particularly to surgery in which a fractured bone is fixed using an element traversing the fracture. In such surgery the fixation element must be installed in a hole carefully and accurately located relative to the fracture and the external forces acting thereon.

In preparing a fractured bone for installation of a fixation element the hole for receiving the element is first defined by a lead which is driven through the bone and across the fracture. The lead will normally be a wire which can be driven through the bone and related tissue without difficulty. A hole is then cut using a suitable tool such as a drill or reamer which has an axial passage therethrough enabling it to follow the path of the wire that remains in the bone. The tool is then withdrawn, and the fixation element installed, once again around the lead. Once the fixation element is installed, the lead can be removed. It is sometimes appropriate to remove the lead before installation of the fixation element.

Use of a lead in surgical operations of the kind described above is essential. However, as the hole for the fixation element has to be made very accurately, and normally in limited space, there is a continuing problem in removing debris in the various stages of hole formation. Further, debris can cause the tool and lead to jam. Once the lead is in place, the cutting tool, drill or reamer, will of course also create more debris and some of this will be forced into the axial passage containing the wire which is guiding the tool. This debris can cause the tool and lead to lock together, and if the drilling continues with the wire projecting ahead of the tool, the wire will be driven further into or through the bone in which it is fitted. This can create considerable complications in the surgical procedure.
Another disadvantage of the drilling tool jamming with the lead wire is that when the tool is withdrawn it often brings the lead wire with it. While this can be acceptable in some circumstances, generally surgeons prefer to leave the lead wire in place until the fixation element is finally installed. Only then is the lead wire withdrawn. Without it of course, there is no guide for the fixation element and the presence of the lead wire helps to ensure that the fixation element is accurately located. In many operations it is desirable that the lead remains in place until the fixation element is finally installed.

According to the present invention a lead for use in orthopaedic surgery comprises a length of wire formed with at least one channel extending longitudinally along its outer surface. Normally, a plurality of channels are provided. However many are used, it or each will preferably extend parallel to the wire axis. The wire will normally be at least 30 cms long, and typically has a diameter in the range of 1 to 4 millimetres. It is normally formed in stainless steel or titanium. If titanium is used, the other tools used in the operation should also be of titanium. The same applies to stainless steel.

The wire of a lead according to the invention will normally have a sharpened end, and the grooves may extend into and along the surface of the sharpened end, substantially to the tip. If they do, the channel walls can diverge towards the tip to facilitate the cutting process. This is though not essential and it will be appreciated of course that the channel or channels by virtue of its or their depth, will partially extend into any tapered section.

As a lead according to the invention is driven into the fractured bone, the debris created is carried away along the channel or channels. This effect is enhanced when the lead is rotated as it is driven through the bone. In the next stage, when the hole is cut for the fixation element, the lead of the invention reduces the risk of jamming between the drilling tool and the lead wire. Not only do the channels in the lead wire provide an escape path for
debris forced into the axial passage in the tool, but debris in the channel or channels creates bodies which can rotate and act as bearings between the external surface of the wire and the internal surface of the axial passage in the tool. In this context it is desirable to form the channel or channels in the lead wire with a cross-section forming a circular arc, typically a semi-circle.

The invention will now be described by way of example and with reference to the accompanying drawings wherein:

Figure 1 shows a perspective view of a section of a lead according to the invention; and

Figure 2 shows the cross-section of a lead according to the invention within the body of a drill or reamer.

Figure 1 illustrates a straight length of stainless steel titanium wire 2, with four longitudinal channels 4 formed in its external surface, and extending longitudinally parallel to the wire axis. As can be seen, the wire 2 has a sharpened end 6, into which the channels extend. On the inclined surfaces of the sharpened end 6, the walls 8 of the channels diverge such that adjacent walls from adjacent channels meet before actually reaching the sharp tip 10 of the end. The channel edges 8 in combination with the sharp tip 10 facilitate the cutting process as the wire is driven through bone in a surgical procedure.

Figure 2 illustrates the lead wire of the invention in the second stage of a surgical operation, when it is acting as a guide for a reamer or drill. The body 12 of the reamer or drill will rotate relative to the wire 2, and some of the debris cut away by the reamer will enter the cylindrical space between the reamer body and the wire. As the stage progresses, debris built up in the channels 4 on the wire form a mobile mass which will move in a generally rotational motion within the channels, forming a bearing which spaces the reamer body 12 from the outer surface of the wire 2. This substantially
reduces the risk of the reamer body locking with the wire and as a consequence, the wire can be left largely undisturbed as the hole is cut. Additionally, this reduces the risk of the wire being withdrawn with the reamer or drill.
CLAIMS

1. A lead for use in orthopaedic surgery comprising a length of wire formed with at least one channel extending longitudinally along its outer surface.

2. A lead according to Claim 1 wherein the length of wire has a sharpened end.

3. A lead according to Claim 2 wherein said at least one channel continues in the surface of the sharpened end.

4. A lead according to Claim 3 wherein the walls of said at least one channel in the sharpened end diverge towards the tip of the end.

5. A lead according to any preceding Claim wherein said at least one channel extends parallel to the wire axis.

6. A lead according to any preceding Claim wherein the wire is formed with a plurality of said channels.

7. A lead according to any preceding Claim wherein the wire has a diameter in the range 1 to 4 mm.

8. A lead according to any preceding Claim wherein the wire is formed in one of stainless steel and titanium.

9. A lead according to any preceding Claim wherein the cross-section of said at least one channel is the arc of a circle.

10. A lead according to Claim 9 wherein the arc is a semicircle.

11. A lead according to any preceding Claim wherein the length of the wire is at least 30 cms.
12. A method of preparing a fractured bone for fixation using an element traversing the fracture, which method comprises driving a lead according to any preceding Claim through the bone and across the fracture; drilling a hole along the path defined by the wire and around the wire with a tool having an axial passage for the wire; and withdrawing the tool while leaving the wire in place.
Application No: GB0619832.9
Claims searched: 1-11

Examiner: Paul Jenkins
Date of search: 9 January 2007

Patents Act 1977: Search Report under Section 17

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