ADJUSTABLE FRACTURE NAIL GUIDE

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In recent years great and beneficial advances have been made in bone surgery. One commonly practiced bone surgery operation is the fixation of the fractured neck of a femur by the use of a fracture nail or pin.

While preparing for the insertion of a fracture nail, such as the well known Smith-Petersen nail, many X-ray pictures from various angles are made to determine the exact angle at which the nail should be inserted into the fractured neck of the femur.

An object of my invention is to provide a fracture nail guide which may be readily adjusted to introduce a fracture nail into the neck of the femur at a proper angle to the shaft of the femur.

A further object is to provide an adjustable guide for the proper angular introduction of a direction wire and/or the subsequent introduction of a fracture nail into the neck of a femur.

A still further object is to provide an adjustable fracture nail guide which may be readily changed to direct a fracture nail at any elected degree of several different degrees of angularity.

In the drawings:

Fig. 1 is a view in side elevation;

Fig. 2 is a view in front elevation;

Fig. 3 is an enlarged irregular vertical cross-section taken on the line 3—3 of Fig. 1, looking in the direction of the arrows;

Fig. 4 is an enlarged perspective view of the portion of the guide adapted to be held against the shaft of a femur;

Fig. 5 is an enlarged perspective view, partly broken away, showing the nail or pin directing portion of the guide;

Fig. 6 is an enlarged perspective view of the guiding sleeve through which a direction wire may be inserted;

Fig. 7 is a view in side elevation showing the adjustable guide positioned against the shaft of a femur showing a direction wire inserted through the guiding sleeve and into the fractured neck of the femur; and

Fig. 8 is a view in side elevation showing the adjustable guide in proper position, a fracture pin or nail inserted through the guide and partially into a femur, and in dotted lines, the representation of a nail driver secured to the head of a fracture nail.

In a great many instances when a fracture nail is to be inserted into the fractured neck of a femur, it will be found that the nail must be introduced through the trochanter at an angle of 120° from the shaft of the femur bone. Often there may be a difference in this desired angle, the same varying as much as from 110° to 135°. By the use of my adjustable guide, that angle may be suitably set before the fracture nail is introduced through the guide and into the neck of the femur.

The adjustable nail guide is provided with a suitable handle 10 conveniently made of a flat metal bar and to the end of which a knurled hand grip 12 may be secured. The handle 10 is suitably secured to a nail or pin guide or tumbler 14 by conventional screws 16. The nail or pin guide or tumbler 14 is preferably made of one piece of stainless steel or other non-corrosive metal and through which a channel or bore 18 is machined, having a proper diameter so that a selected fracture nail and/or a direction wire guiding sleeve 20 may pass. The tumbler or block 14 is also machined to provide studs 22 outstanding from its opposite sides, or the block may be drilled and tapped for a suitable pivot stud.

The nail or pin guide 14 is also provided with a transversely drilled bore or channel 24 within which spring urged cups 26 are positioned. Protruding from the axial center of the cups 26, I provide lugs 28. The external diameter of the cup 26 is equal to (less commercial tolerance) the diameter of the bore or channel 24. Identical cups 26, having identical lugs 28, have positioned within them a compression spring 30 and are placed within the channel or bore 24 at the time that the guide is assembled (see Fig. 3). The lugs 28 are provided with suitable depressions, recesses or indentations 25 to prevent slippage of a stylus or the like to be used to force the lug out of an aperture.

The cups 26 and their cups 26 have thus been positioned within the bore 24, the guide 14 is placed between two plates or blocks 32 which are provided with concave faces 34. The two concave faces 34 when placed together form a concave surface which is adapted to lie against the shaft of a femur bone. The blocks 32 are suitably secured together in their adjusted position by screws 36.

Apertures 40 are provided in the upper portion of the plates or blocks 32 to provide a sufficient amount of tolerance so that the studs 22 may be pivotally positioned therein. Also the plates or blocks 32 are provided with a plurality of apertures 41, 42, 43, 44, 45, and 46 positioned arurally from the apertures 40, being radially equidistant therefrom. The apertures 41, 43 and 45 are positioned approximately 5° out of align-
ment, transversely, with the apertures 42, 44, 46 and 48 respectively. As recited above, the channel or bore 18 is provided through the nail guide 14 so that either a guiding sleeve 20 may be placed therein for the introduction of a fracture nail, or for the direct introduction and guiding of a fracture nail. Normally, if a guide wire 21 is used, either a cannulated or a drilled nail is subsequently inserted into the fracture guide 16 of the femur, its insertion being directed by the guide wire 21. In order to properly insert such a nail, the guiding sleeve 20 will be removed from the bore 18 and a drilled or cannulated nail 50 will be placed over the guide wire 21 which is left temporarily in its directed position within the neck of the femur.

In Fig. 3-7 have shown, in dotted lines, a nail driver 52 which may be screw-threaded into the head of the nail 50 in order to properly drive the nail 18 through the neck guide 16 of the femur and the axis of the neck of the femur may be determined. Having thus determined the angle, the nail guide will be adjusted until the lug 28 is seated in its proper aperture to provide the desired angle between the concave faces 34 and the axis of the bore 18. As shown in Figs. 7 and 8, the lug 28 has been positioned within the aperture 43 and consequently the axis of the bore 18 is at 120° from the axis of the surface of the concave faces 34 of the guide block or plate 32. As shown in Fig. 1, the lug 28 is seated in the aperture 41 and consequently the bore 18 is at an angle of 110° from the axis of the concave faces 34 of the block 32.

In view of the fact that the apertures 41 and 42, 43 and 44, and 45 and 46 are not in alignment, it will be understood that the lug 28 on one side, when in engagement with an aperture, will be so aligned with its complementary lug 29 and cup 27, that the latter will not be in a position to extend within an aperture on their side of the guide. Thus, angular adjustment may be changed by approximately 5° by first positioning a lug 28 within the aperture 41, subsequently the lug 29 within the aperture 42, next, the lug 28 within the aperture 43, etc., until the desired degree of angularity is attained. It will be understood that the apertures 41, 43 and 45 will thus be positioned to effect a change of the angle between the axis of the faces 34 and the axis of the bore 18 the equivalent of 10°. Any suitable distance apart may be provided, but it has been found that it would be impractical to have the apertures positioned closer together.

Likewise, in all circumstances, under the above circumstances, that it probably will be desirable to produce one adjustable guide which may be adjusted to direct a nail at 110°, 115°, 120°, 125°, 130°, 135° and to have a separate adjustable guide produced so that the angularity can be regulated for 115°, 120°, 125°, 127°, 132°, 137°; and/or to have a guide provided in order to be adjustable to angles such as 112°, 117°, 122°, 127°, 132°, 137°; or at any other desirable degree of angularity, the possible change in angularity being approximately 5°. Obviously any other degrees of angularity may readily be provided by adjusting the positions of the mentioned lugs 41 to 46.

I claim:

1. An adjustable fracture nail guide including a block adapted to lie along the shaft of a femur, a drilled block pivoted between plates extending from the first mentioned block, and spring urged studs extending outwardly from said drilled block and adapted to fit into alternate apertures positioned in the said plates at points equally spaced from the said pivot point.

2. An adjustable fracture nail guide including a block having a concave face and spaced-apart plates extending outwardly from near one end thereof, aligned apertures in said plates, a solid block having a drilled bore pivoted at the said apertures, the drilled bore in said block being transverse to the axis of the said pivot points, and a plurality of spaced-apart apertures in said plates positioned radially to the first mentioned apertures.

3. An adjustable fracture nail guide including a positioning portion adapted to lie along the shaft of a femur bone, a block, having a bore therethrough, pivotally secured to the said positioning portion, a plurality of spaced-apart apertures in opposite sides of the said positioning portion, and spring-urged studs held within the said block and adapted to penetrate alternate apertures.

4. An adjustable fracture nail guide including a positioning block adapted to lie along the shaft of a femur bone, spaced-apart plates extending from the said block, a solid block having a bore therethrough and pivotally secured to the said positioning block between the said plates, apertures in the said plates equally spaced from the said pivot point, the said solid block having an additional bore therethrough positioned transversely to the first mentioned bone, and outwardly urged spring pressed studs adapted to engage selected individual apertures.

5. A fracture nail guide including a block having a concave face and spaced-apart plates extending from the opposite side thereof, a solid block pivotally secured between the said plates and having a drilled bore therethrough, a plurality of apertures in said plates spaced radially from the pivot point of the said solid block, and spring urged studs adapted to project laterally from the said solid block.

6. A fracture nail guide including a block having a concave face and spaced-apart plates extending from the opposite side thereof, a block pivotally secured between the said plates and having a bore therethrough lying along the said first mentioned block, a plurality of spaced-apart apertures in said plates equidistant from the pivot point of the said solid block, and transversely positioned spring urged studs within the said solid block and adapted to become engaged in the said spaced-apart apertures.

7. An adjustable fracture nail guide including a block adapted to lie along the shaft of a femur, a drilled tumbler pivoted between plates extending from the said block, spring urged studs extending outwardly from said drilled tumbler and adapted to fit into alternate apertures positioned in the said plates at points equally spaced from the said pivot point.

8. An adjustable fracture nail guide including
a block having a concave face and spaced-apart plates extending outwardly in parallel planes from one end thereof, aligned apertures in the said plates, a tumbler having a drilled bore pivoted between the said plates at the said apertures, the drilled bore in said tumbler being transverse to the axis of the said pivot points, and a plurality of spaced-apart apertures in the said plates positioned radially to the first mentioned apertures.

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