United States Patent [19]

Vestby

[11] **3,892,233**

[45] **July 1, 1975**

[54] **HIP NAIL**

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[22] Filed: **Jan. 9, 1974**

[21] Appl. No.: **431,911**

Related U.S. Application Data

[63] Continuation of Ser. No. 266,373, June 26, 1972, abandoned.

[52] **U.S. Cl.** ..... **128/92 BA**

[51] **Int. Cl.** **A61f 5/04**

[58] **Field of Search** ..... 128/92 BA, 92 R, 92 B, 128/92 BB, 92 BC, 92 CA, 83; 85/13, 14, 19, 85/29

[56] **References Cited**

OTHER PUBLICATIONS

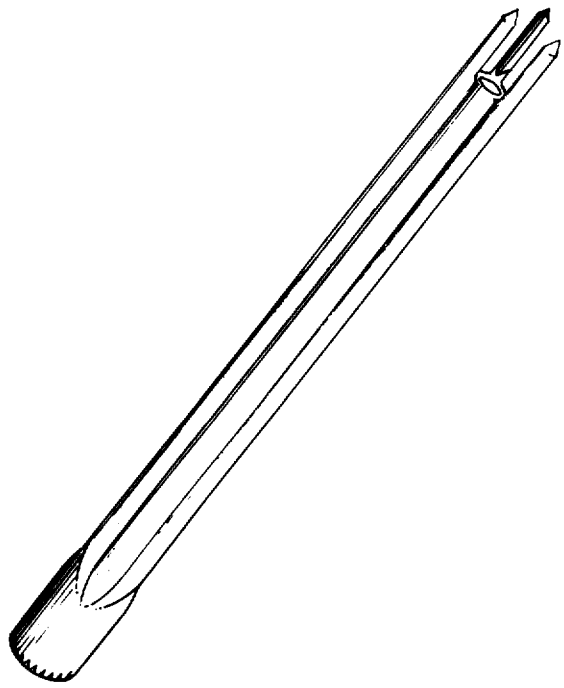
Downs Bros. Orthopedic Catalogue, page G 20 FIG. G 140, May 1966.

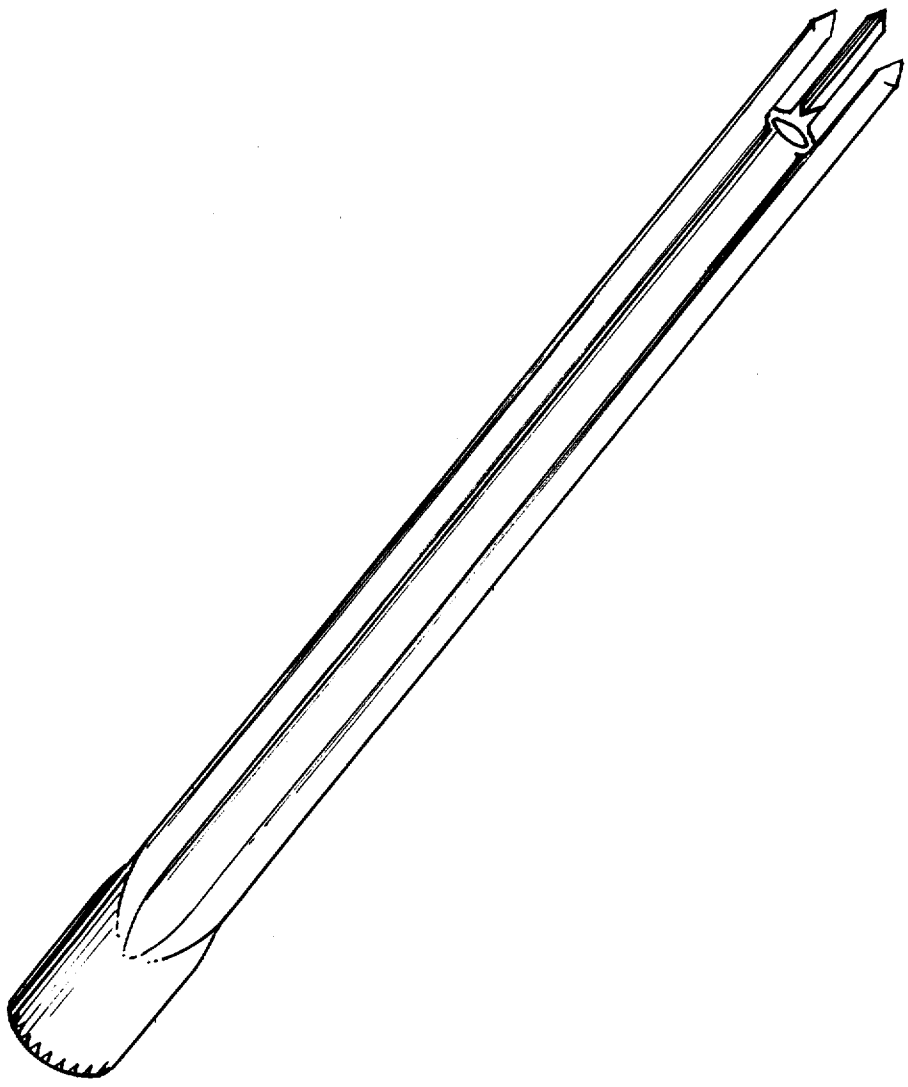
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[57] **ABSTRACT**

Hip nail particularly adapted for determining vascular injury in the femoral head and which gives improved fixation of the fragments.

2 Claims, 1 Drawing Figure





HIP NAIL

This is a continuation, of application Ser. No. 266,373 filed June 26, 1972, now abandoned.

This invention relates to a hip nail.

In fractures of the femoral neck the fragments are operatively fixed by means of special nails which connect the femoral neck and the femoral head. This method is generally known and the nail used is preferably of the type Smith-Petersen/Sven Johanson. This nail was originally constructed by the Norwegian-American Smith-Petersen in 1925. A disadvantage of this nail, however, was that it was necessary to open the actual hip joint in order correctly to position the nail. This was therefore improved or modified by the Swede, Sven Johanson, in 1932. Sven Johanson bored a cannulla in the original Smith-Petersen nail so that the nail could be positioned correctly by threading the nail onto a guide wire inserted extra-articulately (a so-called Kirschner-wire).

Despite highly developed operating technique, a high percent of postoperative complications still arise. The two most important complications are

a. the fracture will not unite (so-called pseudoarthrosis) in about 10 % of the cases.

b. the femoral head becomes necrotic and fragmentates (so-called capital necrosis) in about 30 to 40 % of cases.

It is now generally assumed that capital necrosis is due to vascular injury. This vascular injury occurs in most cases at the moment of injury; however, the actual complication is manifested as a rule only after 1 to 2 years, possibly later. At the present time, pseudoarthrosis (deficient union or lack of union) is considered to be due to poor fixation of the fragments, which would indicate that the nails used today are not entirely satisfactorily.

The object of the invention is to provide a hip nail which

a. is particularly adapted for determining vascular injury in the femoral head and which

b. gives improved fixation of the fragments.

For determining vascular injury, the inventor has, from February 1965, used a new technique. The method and preliminary results have been published in Investigative Radiology, volume 2, No. 3, May–June 1967 (Percutaneous Intraosseous Venography Through the Hip Nail in Fractures of the Femoral Neck. Report of a New Method and Preliminary Results).

This examination is based on the venous drainage from the femoral head. This is made visible on X-ray film by injecting contrast through a bone canulla passed into the femoral head through the cannulla of the nail. A provision of this examination is at the distance from the point of the nail to the surface of the femoral head is 5 mm, preferably more. If, the nails presently used are driven well into the bone, as is frequently done and should be done in order to obtain good fixation, this distance is insufficient and prevents the use of the described method of examination.

The invention relates to a hip nail of the type comprising a hollow body having over a substantial part of its length axially directed, continuous, radially projecting fins, and which at one end thereof is formed for securement, the nail being characterized in that the other end of the nail which is to be inserted into the femoral head of the hip bone is formed with projections in the

longitudinal direction of the fins from the end points of the body, the free ends of the projections are pointed so as to produce an open field of visibility (radiologically transluscent space) between the fin extensions.

The number of projections can correspond to the number of fins and the cross-section of the projections corresponds approximately to the cross-section of the fins. The free ends of the projections are pointed, the points being formed by facet grinding of the free ends of the projections. Further, in accordance with the invention, the projections with points can be provided with sharply ground edges.

The use of the new nail facilitates, by means of X-ray television, the disposition of the point of the bone cannulla through the open projections in the nail. The necessary distance described hereinabove, from the point of the nail to the surface of the femoral head, is eliminated and the examination (percutaneous intraosseous venography) can be carried out in all cases.

As stated hereinabove, the provision for good fracture union is good fixation. Similarly, that the fragments are as closely adjacent as possible. By using blunt nails, particularly when these are fixed by means of a plate, it is difficult to achieve good contact. A pointed nail with less resistance to insertion will, on the other hand, improve this condition.

Comparative experiments have been undertaken with a hip nail of the conventional type and a hip nail according to the invention. The known nail had a blunt end (Smith-Petersen type), the nail according to the invention was machined so as to have three flukes with sharply ground edges (in accordance with the invention).

Pressure insertion experiments and torsion experiments were undertaken in Hartmoltopren Fl, volume by weight 200 kp/m³. Hartmoltopren is expanded from Farbenfabriken Bayer AG.

Pressure Insertion Experiments.

Insertion (mm)	Known nail (Smith-Petersen)	Force necessary (kp) Nail according to the invention
0	1	1
1	20	11
2	32	17
3	37	22
4	40	27
5	47	33
10	71	39
15	95	52
20	122	66
25	"	73
30	"	"

The nail according to the invention requires, at a depth of 10 mm, about 45 % less force, and at 20–30 mm depth, about 40 % less force than the previously known nail in order to be forced into the material.

Comparative Torsion Experiments.

Nail	Insertion (mm)	Required torque (kpcm)
Known nail	10	17
	30	40
Nail according to The invention	10	16
	30	81
	30	76

The known nail and the nail according to the invention require the same torque at 10 mm insertion. At 30 mm insertion the plastic becomes somewhat crushed under the known nail which entails low values for the torque.

From this torsion experiment, it may be deduced that the danger of displacement, that is to say relative rotation of the fragments, is correspondingly less with the new nail.

An embodiment example of a nail according to the invention is illustrated on the drawing.

Having described my invention, I claim:

1. A hip nail adapted to be inserted into the femoral head of the bone, said nail comprising

an elongated hollow body having a given minimum diameter and having along a substantial part of its length a plurality of axially directed continuous radially projecting fins,

means for facilitating precutaneous intraosseous venography and for minimizing bone crushing upon nail introduction into bone and for minimizing the force necessary for introduction, said means including:

a longitudinal projection of each of said fins extending at least a distance corresponding to the minimum diameter of the nail body beyond the end of said body and having a cross-section corresponding generally in size, shape and radial position to the cross-section of its respective fin so that an open field of visibility exists between said projections when said nail is viewed from one side.

2. A hip nail as recited in claim 1 wherein said facilitating and minimizing means further include a point on the free end of each of said projections.

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