the squeezing out (sequestering) of the implant in the case of a load, because the fiber ring is damaged and does not heal. In existing surgical techniques by conglutinating the fiber ring or also by using a closure device, implants should be hindered to be squeezed out from the intervertebral disk. For this purpose, systems such as the CE certified Barricaid© or also the so-called Inclose System (Anulex Technologies, Inc., Minnetonka, MN (not certified for the EU)) have been used. Nevertheless, the problem of squeezing out of the implant in the case of a load could not be solved satisfactorily so far.

Description of the invention

Summary

Thus, ~~embodiments of~~ the present disclosure ~~invention~~ seeks to provide an operation set by means of which an implant can be inserted into an intervertebral disk, is fixed and wherein a corresponding operation method leads to permanently good results.

~~This object is solved by the independent patent claim 1. Advantageous embodiments of the invention arise from the dependent patent claims.~~

According to an ~~first~~ aspect of the present ~~invention~~disclosure, there is provided a set for the endoscopic fixation of an implant in an intervertebral disk by means of a nail or pin comprising: an applicator sheath which is insertable through an endoscope into an intervertebral disk and through which an implant is insertable into an intervertebral disk defect; a drill wire guide sheath sized to be insertable into the applicator sheath; and a pusher for mediating blows during fixation of an implant in the intervertebral disk by means of a nail or pin, wherein the pusher being sized to be insertable into the applicator sheath, and a drill wire, in particularly a K wire, for predrilling a hole through an implant into the osseous part of a vertebral body.

The disclosure ~~invention~~ relates to a set for the endoscopic fixation of an implant in an intervertebral disk by means of a nail or pin which has been adjusted innovatively to the special requirements during a corresponding operation at an intervertebral disk. In the context of the invention, at first, it has been recognized that it should be possible to fix an implant in an intervertebral disk by nails or pins which in particularly are resorbable. Thus, the invention is based on the idea for a novel surgical method. But, then, this novel surgical method requires a surgical set which is especially tailored for it.

A fixation of implants by means of a resorbable nail or pin is already known from other fields of medicine. So, a pin fixation is used in orthopedy in the case of the refixation of fragment parts of the meniscus. In addition, it is used for the fixation of resorbable implants in the case of articular cartilage defects in the knee. But, the properties of articular cartilage in the knee

are substantially different from cartilaginous tissue of the intervertebral disk so that here a direct transfer to operations of intervertebral disks is not possible. Furthermore, existing instruments for the fixation of a pin in a knee joint are not suitable for conducting an operation at an intervertebral disk during which an implant is fixed in an intervertebral disk by means of a nail or pin.

The invention relates to a set for the endoscopic fixation of an implant in an intervertebral disk by means of a nail or pin. The set of instruments can be used in an operation at an

Patent claims

1. A set for the endoscopic fixation of an implant in an intervertebral disk by means of a nail or pin comprising:

an applicator sheath which is insertable through an endoscope into an intervertebral disk and through which an implant is insertable into an intervertebral disk defect;

a drill wire guide sheath sized to be insertable into the applicator sheath; and

a pusher for mediating blows during fixation of an implant in the intervertebral disk by means of a nail or pin, wherein the pusher being sized to be insertable into the applicator sheath, and a drill wire, in particularly a K wire, for predrilling a hole through an implant into the osseous part of a vertebral body.

2. The set according to the preceding claim, wherein the applicator sheath comprises a beveled tip, a hollow cylindrical main part and a flange-like end piece.

3. The set according to any of the preceding claims,

wherein the beveled tip comprises two tip ends formed by recesses in the applicator sheath; and/ or

wherein the tip of the applicator sheath is rotationally asymmetrically beveled with respect to the longitudinal axis of the applicator sheath.

4. The set according to any of claims 2 to 3,

wherein the beveled tip is rotationally asymmetrically beveled with respect to the longitudinal axis of the applicator sheath and has two tip ends; and

wherein both tip ends and at least one line passing therethrough which is parallel with respect to the longitudinal axis of the applicator sheath define at least one tip plane;

wherein, (1) with respect to a tip plane, an upper bevel of the tip is geometrically described by an intersection with an upper plane inclined at an upper acute angle α with respect to said tip plane; and/or

wherein, (2) with respect to the same or a further tip plane, a lower bevel of the tip is geometrically described by an intersection with a lower plane inclined at a lower acute angle β with respect to said tip plane.

5. The set according to ~~the preceding~~ claim 4,

wherein for the upper acute angle α the following applies: $20° \leq \alpha \leq 30°$, in particular $\alpha = 25°$; and/ or

wherein for the lower acute angle β the following applies: 20° ≤ β ≤ 30°, in particular β = 25°.

6. The set according to any of claims 3 to 5, wherein both tip ends have, in a direction orthogonal to the longitudinal axis of the applicator sheath, a height h for which holds:

0.5 mm ≤ h ≤ 1.5 mm, in particular h = 1.0 mm.

7. The set according to any of the preceding claims, wherein the drill wire guide sheath comprises a hollow cylindrical main part and a flange-like end piece.

8. The set according to any of the preceding claims,

wherein the pusher comprises, optionally a mandrel at its proximal end; a cylindrical main part and a pusher header at its distal end; and/ or

wherein for a length LSK of the pusher header along the longitudinal axis of the pusher the following applies: 13 mm ≤ LSK ≤ 17 mm, in particular LSK = 15 mm; and/ or

wherein for an outer diameter DSK of the pusher header the following applies:
8 mm ≤ DSK ≤ 12 mm, in particular DSK = 10 mm; and/ or

wherein for the length LD of the mandrel along the longitudinal axis of the pusher the following applies:
1.9 mm ≤ LD ≤ 2.1 mm, in particular LD = 2.0 mm; and/ or

wherein for the outer diameter DD of the mandrel the following applies:
0.9 mm ≤ DD ≤ 1.1 mm, in particular DD = 1.0 mm.

9. The set according to any of the preceding claims,

wherein for an outer diameter DA of the applicator sheath the following applies:
3.9 mm ≤ DA ≤ 4.1 mm, in particular DA = 4.0 mm; and

wherein for an inner diameter dA of the applicator sheath the following applies:
3.3 mm ≤ dA ≤ 3.5 mm, in particular dA = 3.4 mm; and

wherein for an outer diameter DB of the drill wire guide sheath the following applies:
2.9 mm ≤ DB ≤ 3.1 mm, in particular DB = 3.0 mm; and

wherein for an inner diameter dB of the drill wire guide sheath the following applies:
2.3 mm ≤ dB ≤ 2.5 mm, in particular dB = 2.4 mm; and

wherein for an outer diameter DS of the pusher the following applies:
2.9 mm ≤ DS ≤ 3.1 mm, in particular DS = 3.0 mm.

10. The set according to any of the preceding claims,

wherein for a length LA of the applicator sheath the following applies:

215 mm ≤ LA ≤ 290 mm; and

wherein for a length LB of the drill wire guide sheath the following applies:

210 mm ≤ LB ≤ 285 mm; and

wherein for a length LS of the pusher the following applies:

220 mm ≤ LS ≤ 305 mm; and

wherein further the following applies: LB < LA < LS; and

wherein the specified lengths LA, LB and LS are determined in the case of the presence of a flange-like end piece or a header at the respective component without the respective flange-like end piece or without the header.

11. The set according to any of the preceding claims,

wherein for a length LFA of a flange-like end piece of the applicator sheath along the main axis of the applicator sheath and for an outer diameter DFA of the flange-like end piece of the applicator sheath the following applies: 2.9 mm ≤ LFA ≤ 3.1 mm, in particular LFA = 3 mm, as well as 9 mm ≤ DFA ≤ 11 mm, in particular DFA = 10 mm; and/ or

wherein for a length LFB of a flange-like end piece of the drill wire guide sheath along the main axis of the drill wire guide sheath and for an outer diameter DFB of the flange-like end piece of the drill wire guide sheath the following applies: LFB = LFA ± 0.1 mm, in particular LFB = 3 mm, as well as DFB ≥ DFA, in particular DFB = 12 mm.

12. A set according to any one of the preceding claims, wherein the components of the set are reusable after appropriate sterilization.

~~13. The set according to any of the preceding claims, which furthermore comprises the following:~~

~~a drill wire, in particularly a K-wire, for predrilling a hole through an implant into the osseous part of a vertebral body.~~

~~14~~13. The set according to any of the preceding claims, which furthermore comprises the following:

an implant for placing in an intervertebral disk.

~~15~~14. The set according to the preceding claim, wherein the implant is porous, spongy, compact, a felt, a fleece or mesh-like.

~~16~~15. The set according to any of the preceding claims, wherein the implant comprises at least one of the following materials:

- collagen;
- hyaluronan (hyaluronic acid);
- polyglycolic acid, polylactic acid and/ or their respective copolymers;
- polycaprolactone;
- a natural membrane, in particularly periosteum, perichondrium and/ or fasciae, as well as their modifications;
- alginate;
- agarose;
- fibrin;
- albumin containing material;
- polysaccharides

as well as combinations thereof.

~~17~~16. The set according to any of the preceding claims, which furthermore comprises the following:

at least one, preferably resorbable and/or (X-ray) radiopaque, nail or pin for the fixation of an implant in an intervertebral disk.

~~18~~17. The set according to the preceding claim,

wherein the, preferably resorbable, nail or pin has a diameter DN for which the following applies: 1.4 mm ≤ DN ≤ 1.6 mm, in particular DN = 1.5 mm; and/ or

wherein the resorbable and/or (X-ray) radiopaque nail or pin has a length LN for which the following applies: 10 mm ≤ LN ≤ 30 mm.

~~19~~18. The set according to any of the preceding claims,

wherein the applicator sheath can be plugged onto an endoscope; and/ or

wherein no further fastening, in particular no screw connection, is required for the connection between an endoscope and the applicator sheath; and/or

wherein the applicator sheath does not comprise a separate holder or handle.