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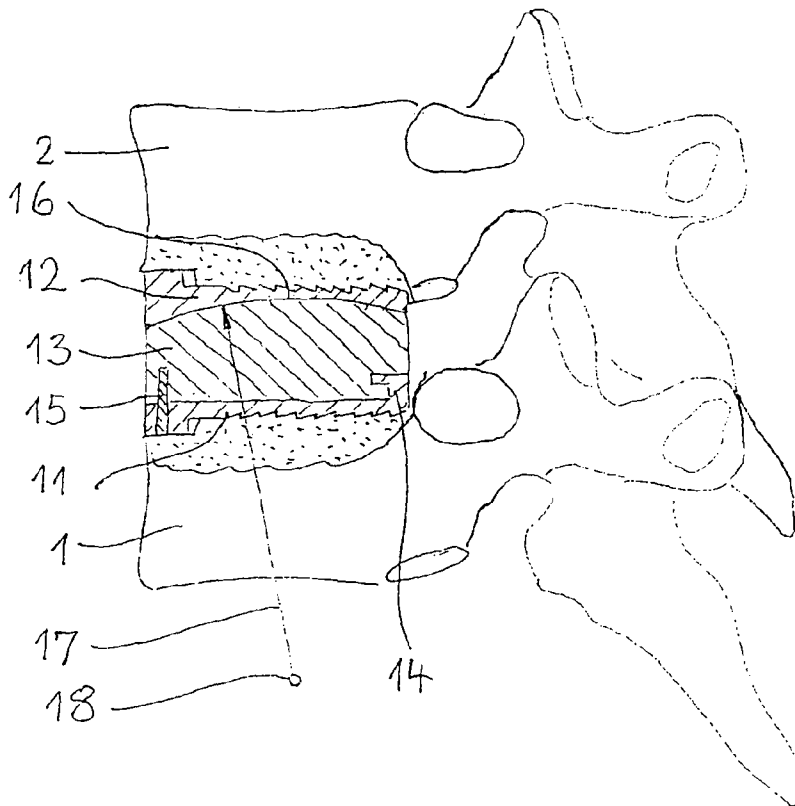
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(54) Title: SET OF CERVICAL INTERVERTEBRAL PROSTHESES

(54) Bezeichnung: SATZ VON ZERVIKALEN ZWISCHENWIRBELPROTHESEN



(57) Abstract: The invention relates to a set of cervical intervertebral prostheses that contain a sliding surface pair (16) for forming a joint between a predetermined center (18) of the joint movement. For improved adaptation to the different joint radii of the cervical intervertebral discs, the invention provides that the set of cervical intervertebral prostheses comprises at least two different prostheses with different radii of curvature (17) on the sliding surface pair (16) and a different joint radius, of which a prosthesis designed for a more cranially lying vertebral pair has a greater radius of curvature (17) of its sliding surface pair (16) than a prosthesis designed for a more caudally lying vertebral pair.

(57) Zusammenfassung: Satz von zervikalen Zwischenwirbelprothesen, die ein Gleitflächenpaar (16) zur Bildung eines Gelenks mit einem vorbestimmten Zentrum (18) der Gelenkbewegung enthalten. Zur besseren Anpassung an die unterschiedlichen Gelenkradien der zervikalen Bandscheiben ist vorgesehen, dass der Satz von zervikalen Zwischenwirbelprothesen mindestens zwei unterschiedliche Prothesen mit unterschiedlichen Krümmungsradien (17) an ihrem Gleitflächenpaar (16) und

unterschiedlichem Gelenkradius umfasst, von denen

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Zur Erklärung der Zweibuchstaben-Codes und der anderen Abkürzungen wird auf die Erklärungen ("Guidance Notes on Codes and Abbreviations") am Anfang jeder regulären Ausgabe der PCT-Gazette verwiesen.

eine für ein mehr kranial liegendes Wirbelpaar bestimmte Prothese einen grösseren Krümmungsradius (17) ihres Gleitflächenpaars (16) als eine für ein mehr kaudal liegendes Wirbelpaar bestimmte Prothese aufweist.

Cervitech, Inc.

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5 Set of cervical intervertebral prostheses

The invention relates to cervical intervertebral prostheses which comprise a pair of slide surfaces for forming a hinge. In a first known type of such prostheses, the center of the hinge movement is located inside the prosthesis (US-A-5425773) or a little above said prosthesis (US-A-5895428). This does not correspond to the natural conditions which the prosthesis is intended to simulate. In another type of intervertebral prosthesis (FR-A-2718635), the hinge is formed by a pair of slide surfaces, the common center of curvature of which lies outside the prosthesis, specifically under it. This approximates to the natural conditions but is still too far remote from them. In a third type of intervertebral prosthesis (US-A-5401269; EP-A-955021; EP-A-1166725), two oppositely directed pairs of slide surfaces, provided on both sides of a lenticular prosthetic core, have an undefined hinge center that adjusts itself automatically. This comes closest to the natural conditions but is difficult to accommodate within the narrow intervertebral spaces of the cervical spine.

The invention is based on the awareness that the centers of the cervical intervertebral hinge movement are different from vertebra to vertebra (L. Penning: Functional Pathology of the Cervical Spine; Excerpta Medica 1968, pages 1 - 23; WO9911203). Starting out from this realization, the invention seeks to approximate the prosthetic hinge movement more closely to the natural conditions.

The invention achieves this aim by making available a set of cervical intervertebral prostheses which

comprises at least two different prostheses with
different radii of curvature on their slide surface
pair and a different position of the center of the
hinge movement. According to the invention, a
5 prosthesis intended for a pair of vertebrae lying more
in the cranial direction has a greater radius of
curvature of its slide surfaces than does a prosthesis
which is intended for a pair of vertebrae lying more in
the caudal direction. Depending on the position in
10 question, the operating surgeon can select a suitable
prosthesis from this set and thus ensure that the
movement of the intervertebral joint fitted with the
prosthesis is more akin to the natural conditions than
was hitherto possible.

15 In some cases it may suffice if the prosthesis set
comprises only two different prostheses, namely a
prosthesis with a radius of curvature of its slide
surfaces above a defined mean value and a prosthesis
20 with a radius of curvature of its slide surfaces below
a defined mean value. This mean value is expediently
18 mm. For example, a set can comprise a first
prosthesis with a radius of curvature of its slide
surfaces of 22 mm and another prosthesis with a radius
25 of curvature of its slide surfaces of 14 mm. It is
desirable to have a larger number of prostheses with a
different slide surface radius, for example the set
cited in the example just cited can be supplemented by
a prosthesis with a slide surface radius of 18 mm and
30 if appropriate a further prosthesis with a slide
surface radius of 10 mm.

The invention also relates to a method for determining
which intervertebral prosthesis from a plurality of
35 intervertebral prostheses with different hinge radius
is suitable for replacing a cervical intervertebral
disk. This method is distinguished in that the hinge
radius of the affected joint is determined and a
prosthesis with a hinge radius approximating to this

hinge radius is selected. In this context, the hinge radius is to be understood as the distance between the center of the hinge movement and the midpoint of the prosthesis. The method is carried out by the manufacturer of the prostheses; for each intervertebral space of the cervical spinal column, the manufacturer determines the average hinge radius from a large number of individuals, or takes this average from the literature, and then assigns to this intervertebral space a size gradation from the set of intervertebral prostheses. The table below shows an example of how the size gradations of the radii of curvature of the slide surfaces are assigned to the individual intervertebral spaces within defined size ranges (in millimeters).

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Intervertebral space	"Large" series	"Medium" series	"Small" series
C2/C3	22	20	18
C3/C4	22	18	18
C4/C5	18	18	16
C5/C6	18	14	14
C6/C7	14	14	12

As regards the use of small radii of curvature, it should be noted that here too the hinge center lies outside the prosthesis.

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The drawing shows an illustrative embodiment to explain the terms used above.

An intervertebral prosthesis made up of a lower cover plate 11, an upper cover plate 12 and a prosthetic core 13 is fitted between the vertebral bodies 1 and 2. The prosthetic core 13 is held securely on the lower cover plate 11 by an undercut ledge 14, running along three sides of the prosthesis, and by a catch 15. With the upper cover plate 12, it forms a spherical slide surface pair 16 having a slide surface radius 17 and a center of curvature 18 which forms the center of

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movement of the hinge formed by the prosthesis. This means that the cover plates 11, 12 and the vertebrae 1, 2 connected to them are able to execute a relative movement with respect to one another which represents a rotation movement about the center 18 as long as the slide surface pair 16 alone determines the relative movement. In practice, other slide surfaces, namely the articular facets, are also involved in determining the relative movement, so that the relative movement actually taking place may deviate a little from this. It will however be appreciated that the hinge movement is all the more harmonious, and continuation of the patient's symptoms all the more unlikely, the more the center 18 of the hinge movement defined by the prosthesis agrees with the natural center of movement. The hinge radius is defined independently of the slide surface radius and differs from the latter in that it is measured from the center of the natural hinge movement to the geometric midpoint of the prosthesis or of the intervertebral space receiving said prosthesis.

The prostheses intended for the more cranial intervertebral spaces (in particular C2/C3 and C3/C4) are distinguished on the one hand by a greater hinge radius than in the prostheses which are intended for the more caudal intervertebral spaces (in particular C5/C6 and C6/C7). On the other hand, the prostheses to be fitted more in the cranial direction can have a smaller surface extent in particular in the AP direction (AP = anteroposterior) than the prostheses to be fitted more in the caudal direction can. Thus, a further characteristic feature of the invention lies in the fact that the set of intervertebral prostheses comprises at least one first prosthesis whose hinge radius is greater and whose surface extent (in particular in the AP direction) is smaller than those of a second prosthesis.

Patent claims

1. A set of cervical intervertebral prostheses which
comprise a pair of slide surfaces for forming a
5 hinge with a with a predefined center of the hinge
movement, characterized in that it comprises at
least two different prostheses with different ra-
dii of curvature on their slide surface pair and
a different position of the center of the hinge
10 movement, of which a prosthesis intended for a
pair of vertebrae lying more in the cranial direc-
tion has a greater radius of curvature of its
slide surface pair than does a prosthesis intended
for a pair of vertebrae lying more in the caudal
15 direction.
2. The set of cervical intervertebral prostheses as
claimed in claim 1, characterized in that it com-
prises at least one prosthesis with a slide sur-
20 face radius above 18 mm and at least one prosthe-
sis with a slide surface radius below 18 mm.
3. The set of cervical intervertebral prostheses as
claimed in claim 1 or 2, characterized in that it
25 comprises at least one prosthesis with a slide
surface radius below 15 mm.
4. The set of cervical intervertebral prostheses as
claimed in claim 1, characterized in that it com-
30 prises at least a first prosthesis which has a
smaller extent in the AP direction and a greater
slide surface radius than a second prosthesis.

- 5 . A method by which a manufacturer assigns a size gradation, from a set of intervertebral prostheses comprising several size gradations, to a defined intervertebral space of the human cervical spine, characterized in that the average hinge radius of this intervertebral space is determined and a size gradation, with a hinge radius approximating to the determined hinge radius, is assigned to it.
- 5
- 10 6. A set of cervical intervertebral prostheses substantially as herein described and as illustrated in Figure 1.

