The invention relates to an intramedullary implant for use between two bones or two bone fragments. The implant includes a single-piece body having a generally elongate shape and having, at each end, areas for anchoring to the bone portions in question, characterized in that one of said areas has a generally cylindrical shape while the other area has a flat cross-section.

18 Claims, 4 Drawing Sheets
RESORPTIVE INTRAMEDULLARY IMPLANT BETWEEN TWO BONES OR TWO BONE FRAGMENTS

CROSS REFERENCE TO RELATED APPLICATIONS


The invention relates to the technical field of orthopedic implants, particularly for arthrodesis and osteosynthesis.

More particularly, the invention relates to an intramedullary osteosynthesis between two bone parts or osteosynthesis between two bone fragments, particularly in the case of the hand or foot.

Different solutions have been proposed to achieve these functions.

For example, a solution comes from the teaching of patent application FR 2,884,406 [US 2008/0177262], of which the applicant of the present application is also the applicant. This patent describes an intramedullary osteosynthesis device constituted of an elongated body whose ends constitute anchor zones cooperating with the bone parts to be immobilized. The anchor zones are shaped and made of a material selected to enable insertion into the bone parts, then to ensure an anchor in the bone parts by preventing any rotational movement by resisting traction and by maintaining a compression force.

Another solution also comes from patent application FR 2007/02003 [US 2010/0131014], also from the same applicant. This document describes an implant in the form of two anchor zones connected by a central zone and whose general shape is substantially inscribed in a very elongated rectangle of X-shape, so as to form in the anchor zones two legs adapted to move apart by elastic or shape-memory effect.

From this design, different criteria have been established to make the implant easy to place and efficient in order to create a primary and secondary stability for the osteosynthesis or arthrodesis site.

However, these solutions are not adapted for the case of an implant made of resorptive material.

From this state of the art, the object of the invention proposes to attain further improving the anchor and the stability of the implant as well as its adaptation to the morphology of the implantation site when the implant is made of resorptive material.

To solve such a problem, a resorptive intramedullary implant between two bones or two bone fragments has been designed and developed; it is constituted, in a known manner, of a single-piece body having a general elongated shape with, at each end, zones for anchoring to the bone parts being considered. According to the invention, one of the zones has a cylindrical shape, whereas the other zone is flat.

Advantageously, the implant is made of a resorptive material whose mechanical properties are determined to last the time necessary for the consolidation, so that the implant is resorbed after six months. For example, the implant is composed of lactic acid polymer or copolymer (PLA, PGA . . . ).

Considering the specific mechanical characteristics of resorptive materials, and to solve the given problem of improving anchor and stability, the cylindrical cross-section is threaded and tapers in the direction of its free end.

To solve the given problem of enabling a deformation by elasticity, thus causing an expansion adapted to the geometry of the site and to the properties of the material, the flat cross-section zone has, substantially in its median portion, an opening adapted to enable elastic deformation of the zone. The opening defines at least two anchor arms.

It therefore appears that the combination of a cylindrical and threaded anchor zone and a flat-sectioned anchor zone is particularly advantageous considering the problem to be solved.

To solve the given problem of resisting the shear and flexion forces susceptible of occurring in the area of the bone site, between the two anchor zones, the body has a central zone of transition adapted to resist the shear and flexion forces occurring in the area of the bone site and adapted to serve as an abutment.

From this basic design of the implant, the anchor zones are either coaxial or angularly offset by about between 1° and 30° and, advantageously, by 10°. The bend between the anchor zones is located so as to substantially correspond to an arthrodesis line of the bones being considered.

The invention is explained in more detail hereinafter with reference to the attached drawings, in which:

FIG. 1 is a perspective view of the implant;
FIG. 2 is a front view of the implant before insertion into the bone part in question;
FIG. 3 is a side view corresponding to FIG. 2;
FIG. 4 is a view like FIG. 2 showing the position of the anchor arms of the flat section after insertion;
FIG. 5 is a perspective view of another advantageous embodiment of the implant;
FIGS. 6 and 7 show the installation of the implant into two bone parts.

The implant according to the invention has a one-piece body 1 of elongated shape and having a first proximal zone A1 and a second distal zone A2. The entire implant body is made of a resorptive material whose mechanical properties are determined for the implant to be resorbed in no less than about 6 months. In one embodiment, the implant is composed of lactic acid polymer or copolymer (PLA, PGA . . . ).

As will be described later in the description, the zones A1 and A2 have anchor formations for the respective bone parts. Taking into account the specific characteristics of the resorptive material and to attain the given object of anchor and stability, the zone A1 is of a cylindrical shape section whereas the other zone A2 is flat.

The zone A1 has a generally cylindrical outer surface 1a with a limited taper toward its free end. The surface 1a has a helical rib forming a screwthread 1d.

The zone A2 is flat and has substantially in its center, an opening 1b adapted to enable elastic deformation of the zone A2. More particularly, the opening 1b defines at least two anchor arms 1c and 1d, each having at least one outwardly projecting tooth 1c1, 1d1.

Advantageously, between the two zones A1 and A2 the body 1 has a central zone C for transition adapted to resist shear and flexion forces that can occur at the end of a bone. By way of nonlimiting example, this median zone C can have a length of about 3.5 mm and a thickness of about 2 mm, for an overall implant length comprised between about 15 and 25 mm and a diameter of about 2 or 3 mm at the zone A1.

In the embodiment shown in FIG. 1, the two zones A1 and A2 are coaxial.

To solve the problem of adaptation to the shape of the implantation site, the anchor zones A1 and A2 can be offset at an angle α adapted to the geometry of the bone site. This angle α can be about 10°.
The invention claimed is:

1. An intramedullary implant for use between two bones or bone fragments, the implant comprising:
   a one-piece body having an elongated shape, the body having opposing first and second ends, each of the ends having a longitudinal axis therethrough and an anchor zone for anchoring to a respective bone part,
   wherein the anchor zone of the first end is threaded and has a generally cylindrical shape and the anchor zone of the second end has a flat cross-section in a direction perpendicular to the longitudinal axis thereof, and
   wherein the anchor zone of the second end has a plurality of outwardly projecting teeth forming a portion of the flat cross-section thereof, at least a first tooth of the plurality of teeth being spaced from a second tooth of the plurality of teeth in a direction along the longitudinal axis of the second end, and at least the first tooth facing in a direction opposite a third tooth of the plurality of teeth and the second tooth facing in a direction opposite a fourth tooth of the plurality of teeth.

2. The implant according to claim 1, wherein the zone of flat cross-section has substantially in its median portion an opening adapted to allow elastic deformation of the flat zone.

3. The implant according to claim 2, wherein the opening defines at least two anchor arms.

4. The implant according to claim 1 wherein, the body has a central transition zone between the two anchor zones adapted to resist shear and flexion forces occurring in the area of the bone site, the central transition zone including a step having a face defining a plane perpendicular to the longitudinal axis of the first end adapted to serve as an abutment preventing overinsertion of the implant into the respective bone part.

5. The implant according to claim 1 wherein the anchor zones are coaxial.