Guiding device able to be coupled to the head of a surgical handpiece.

**Priority Number**

**Patent Type**
Patent for invention.

**Co-Ownership**
Sapienza University of Rome 100%.

**Inventors**
Michele Cassetta.

**Industrial & Commercial Reference**
Dentistry, implantology, computer-guided implantology.

**Time to Market**
The device in question has already been tested in the clinical field.

**Availability**
Cession, Licensing, Research, Development, Experimentation, Collaboration, Start-up and Spin-off.

**Abstract**
When using a surgical guide to insert a dental implant, a potentially clinically relevant error may be the mechanical error caused by the bur guide cylinder gap due to the presence of a rotational allowance of drills in the tubes. The aim of the present device is to reduce the total error by limiting the tolerance among the mechanical components. The present device, minimizing the tolerance between the mechanical components, reduce substantially the total error in computer guided implantology - deviation between the position of the implant postoperatively (inserted implant position) and the position of the implant in the planning (planned implant position) (mean angular deviation: 2.02; range: 0.81–3.4; standard deviation: 0.87).

**Publications**


Technical Description
The present device can be applied to any surgical handpiece and allows to improve the accuracy of all computer-guided implantology systems currently in use. The device, thanks to the use of a series of tubes of decreasing length, allows the preparation of the implant site without generating friction, substantially reducing the error that originates from the tolerance between the mechanical components of computer-guided implantology systems.

Technologies & Advantages
To reduce the total number of computer-guided implantology surgical guide mechanical components, the guide tubes are connected directly to the head of the surgical handpiece. Guide tubes of decreasing length are constructed in order to advance the surgical osteotomy with maximum control.

During osteotomy, increasingly longer guide tubes are inserted into the master tube of surgical guide and they progress inside the master tube with only a vertical movement of entry and exit. The tolerance to be considered between the mechanical components of this modified system is the one between the master tube and the guide tube of the surgical handpiece, which is 0.05 smaller than the master tube. This tolerance leads to a maximum theoretical angular error of 0.71, as demonstrated by the following calculation: \[ \alpha = \arctg \frac{0.05}{4} = 0.71. \]
The surgical bur rotates inside the surgical handpiece guide tube without creating any friction and without overheating the implant site, but offering better control over the osteotomy. The contact occurs only between the internal tube and the guide tube of the handpiece, and it does not generate any type of friction during its progression in depth because there is no rotation between these components. The present device show that by limiting the error that originates from the mechanical components, the total error could be reduced; in particular, if the total error is considered without mechanical error, interesting considerations can be made. In the traditional systems, the value of mechanical error that should be subtracted from the total error is 2.57° (half the maximum theoretical angular mechanical error); in the present modified system it is 0.358.

Applications
The application field is the computer-guided surgery.