

Stereotactic Radiosurgery Head Frame Holder

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Function:

When a patient has a tumor or another type of abnormality, one way to reduce the size of the tumor is stereotactic radiosurgery. Stereotactic radiosurgery is a method of delivering radiation to a patient in an extremely precise manner using a linear accelerator. When the radiosurgery is performed, a halo “ring” is attached to the patients scalp at 4 screw-in attachment points. Our goal is to design a device which holds the halo independent of the patients head position and movements so that one physician can attach the head frame while the patient is sedated.

Client requirements:

- Must be able to move up and down the distance of a total head length.
- Must be able to move frontally and dorsally up to 1.5 in.
- Must be able to tilt minimally from the pivot point at the back.
- Cannot change the existing halo in any way. Can screw in to the existing holes in the head frame.
- Support to keep head and airway tilted to 45 degree angle.
- Must maintain easy access to head attachment points even when device is in place.
- Must have a head support in addition to the frame support.

Design requirements:

1. Physical and Operational Characteristics

a. *Performance requirements*: Must be used for 10-15 minutes in the morning for each procedure. Can be used 1-2 times a day, 50-60 times a year.

b. *Safety*: Must keep airway open and head stabilized. Must be support so that the head frame does not fall on the patient.

c. *Accuracy and Reliability*: Must move 1.5” in the forward and backward directions, and a whole head length up and down(measurement to be determined later).

d. *Life in Service*: Reusable, must be usable 50-60 times a year, ideally for multiple years.

e. *Shelf Life*: There are no degradable components to our design. Theoretically the device should have an indefinite shelf life when properly stored.

f. *Operating Environment*: The device will be operated in a hospital. It need not be sterile, but should be resistant to wear and dirt, and easy to clean.

g. *Ergonomics*: Should be easy to operate by one physician.

h. *Size*: Will only need one size, as it docks into a precisely standardized halo. Will also need to be attached to a standard wheelchair.

i. *Weight*: Weight is not an issue, should be able to be transported in and out of storage by 1-2 people.

j. *Materials*: Halo is made out of titanium, the material should be something that does not damage easily, and strong enough to support the weight of the head frame and human head without deforming.

k. *Aesthetics, Appearance, and Finish*: Aesthetically pleasing. Appearance isn't really an issue, it should be free of rough edges and sleek for safety.

2. Production Characteristics

a. *Quantity*: 1 deliverable.

b. *Target Product Cost*: Between \$500-\$1000, additional funding will be available if specialized materials need to be ordered.

3. Miscellaneous

a. *Standards and Specifications*: Must be approved for safety and function by the physicians utilizing the device.

b. *Customer/Patient related concerns*: Not applicable, device does not come in direct contact with patient.

d. *Competition*: There is currently no product on the market that secures the head frame while it is being attached.

