Two Technical Modifications for the Leksell Stereotactic Frame

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Abstract

Objective: Describing a newly designed frame holder applied to the head before pin fixation. The already available ear plugs facilitate the straight alignment of the frame by fixing it to the external auditory meatus, but they are quite painful for most of the patients and cannot prevent the anterior posterior rotation. The Leksell frame (Elekta, Sweden) is provided with a clamp that fits only with Mayfield head frame(SM, USA). We performed certain modifications to make the frame fit to the Sugita head clamp (Mizuho, Japan); the only sort of head frame we have in our hospital.

Patients Methods: The new modifications were used to fifteen patients in whom the application of the frame was indicated. A new designed net made of sewed ribbons applied to the head before pin fixation. It prevents slipping of the frame especially with the aid of the top plastic cup for its suction ability over a well shaved head. No pain recorded with its use. The other modification was to make few changes with the sugita head clamp middle piece to make it adaptable with that of the Leksell which was originally designed for the Mayfield head clamp.

Results: The newly designed net caused no pain to all the patients. Slipping was minimal. The time of the application of the frame shortened. With the use of the new adapter with the Leksell frame, we were able to perform surgical interventions even as long as 8 hours as in deep brain stimulation operations with no movement noticed between the frame and the operating table.

Conclusion: These two technical modifications were useful to help in application of the frame over the patients head with minimal slipping movement and no pain. It permitted us to use the Leksell frame with the sugita head frame which is the only sort of head frame we have in our hospital.

Keywords: Leksell frame, Neurosurgical operations

Introduction

The Leksell Frame (Elekt, Sweden) is widely used for functional neurosurgical operations. For the proper application of the frame on the patients head; it is provided with ear plugs these will prevent side way movement but it is quite painful and cannot be tolerated actually with all our patients. Also it will not prevent the foreword backward slipping of the frame. The frame is provided with head clamp compatible
with only the Mayfield head holder (SM, USA) ; making it inadaptable with the head frames like the sugita head frame (Mizuho, Japan); the only sort of head frame we have in our hospital[1,2,3].

**Patients and Methods**

In late 2007 and early 2008 we used these techniques for fifteen patients. Nine had deep brain stimulation (DBS) of the subthalamic nucleus for Parkinson’s disease; one patient had DBS of the ventral intermediate nucleus for rubral tremor. One patient had DBS of the Globous pallidus internus nucleus for Dystonia. One patient had stereotactic removal of tuberculomas using the Steiner Lindquist laser guide (Elekta, Sweden); the last three patients it was used for stereotactic biopsy of deeply seated brain tumors.

The Leksell frame fixation is usually done in the radiology department. The head frame holder is composed of three straps sewed together to hold the temporal and occipital bars of the frame. The top of each strap is connected with plastic cup to fit firmly to the head & prevents its slipping by its suction ability over a well shaved head. Each one of them is sewed in its end with a tag to allow readjustment of the frame on the head. The straps on the temporal bars composed of two pairs to let an opening to observe the external auditory meatus; this is needed to align the frame along the canthomeatal line. We apply it of the patients head & fit the frame within its multi adhesive tags. The alignment of the frame can be readjusted frequently until we fix the pins & remove the straps. These straps didn’t cause any pain or discomfort as the ear plug did to all the patients. They also prevent unwanted wide movement or slipping of the frame. Figures 1, 2, and 3.

![Figure (1): The five straps sewed together, they are connected in their ends with tags to adjust its length.](image1)

![Figure 2. The straps applied to the Leksell frame on both temporal bars (two ribbons on each side) & the occipital one.](image2)

![Figure 3. The frame with the straps applied on the patients head.](image3)
In the operating theatre in order to apply the Leksell frame to the sugita head frame, we took the middle piece of the head holder. We removed the central slide adjusting screw & change it with a longer one with a knob that is usually available in the intravenous fluids (i.v.) stand. The paramedian screws exchanged with another longer ones. Figures 4, 5, and 6.

Figure (4): The middle piece of the Sugita head holder, a. back view, b. front view.

Figure (5): The two paracentral screws removed & replaced with longer ones so that their tips will be engaged with the Leksell Cognave, a. side view, b. front view.

Figure (6): The long screw with knob of the i.v. stand to replace the middle screw of the central part of the sugita head holder.

Figure (7): The Leksell clamp, a. lateral view, b. back view.
Figure (8): The sugita middle piece of the head holder is connected with the Cognave of the Leksell clamp via the i.v. stand knob & prevented from rotational movement by the tips of the paramedian screws which engaged with the teeth of the Cognave, a. lateral view, b. back view.

**Results**

During the use of this new frame no pain or discomfort were noticed on our patients. The frame fixed firmly to the table attachment of the sugitta head frame. No movement was noticed during the whole procedures between the operating table and the frame even in those DBS cases were the surgery with the frame applied to the patient extended for 8 hours. Figures 9, and 10.

**Discussion**

These technical modifications were important in our practice to facilitate the application of the frame over the head with minimal movement & shorter time. Although it may resemble that of the CRW frame (Radionics, USA) put the design is different & the slipping is much less than that with CRW frame. The adapter we made to fit the Leksell frame to the sugita was quite useful especially we not have the Mayfield head clamp in our hospital.

Figure (9): The sugita head frame is connected with the Leksell frame in DBS surgery

**Conclusion:** These two modifications are good alternatives to replace the ear plug which is quite painful for many patients & it will make those centers that have only the sugitta head frame to use it with the Leksell stereotactic frame.
References

