

Deep Brain Stimulation for Post Traumatic Tremor

Introduction

After severe head injury a significant number of survivors will suffer from crippling movement disorders of which tremor is particularly disabling. In a survey of 289 severely head injured children significant tremor was noted in 45% within 18 months of follow up. However, in half the cases the tremor improved with time.¹

In those patients with severe post traumatic tremor one common finding is of lesions in the projections from the cerebellum to the thalamus typically in the mid brain.² The tremors are of a violent nature and often affect the shoulder and arm. The shoulder tremor is usually of a wide displacement rendering the patient unable to do anything and can also make nursing virtually impossible.

Medical therapy is rarely helpful but it is worth trying L Dopa in all such patients as occasionally there are some responders.³ However, in such patients surgery is the best hope of alleviation.

In the past, lesioning the thalamus was the therapy of choice.⁴ Although the results reported have been good there are many disadvantages. In an injured brain, to cause further damage by a lesion runs the risk of high side effects, also many such patients may have bilateral tremor and bilateral lesions would be at high risk particularly to speech and swallowing. We therefore feel that deep brain stimulation is the treatment of choice.

Patient selection

People with head injuries will also quite commonly have problems with ataxia or inco-ordination in addition to tremor. This will affect the response to surgery which will only help tremor. To better select candidates for surgery we have used visually guided tasks.

VISUALLY GUIDED WRIST RAMP TRACKING TASK

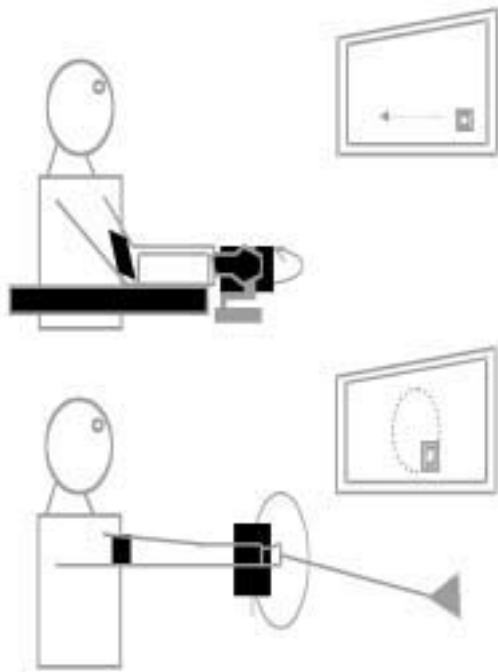


Figure 1: Wrist tracking (top), shoulder tracking below. As illustrated (Fig 1), patients are sat comfortably in front of a screen and use a joy stick to track a target moving across the screen. Movements of the forearm for distal tremor and whole arm for shoulder tremor can be recorded. We found that patients with a distal tremor with a single frequency responded better to thalamic surgery targeted at the VOP nucleus than patients with irregular jerky movements. Proximal single frequency tremor responds to stimulation deeper in the zona incerta.

Case report

We illustrate this with the case of a man aged 26 years. At the age of 18 years he was hit by a car suffering severe head and chest injuries. He was left with a right hemiparesis although the left side was functional. 12 months after his injuries he began to develop tremor of his left arm which progressed to a severe almost ballistic movement disorder, at which time, he was referred for consideration of deep brain stimulation. An MRI scan of his brain showed a lesion of the left cerebellar peduncle consistent with his symptoms.

He underwent visual guided tracking which showed there was a tremor with frequency of 5 Hz (Fig 2). He was then offered surgery and a right VOP/ZI electrode was implanted stereotactically (Fig 3) with good suppression of the tremor during the operation (Fig 2).

He remains well, with functional use of his left arm. He is able to feed himself, drink but unable to perform fine tasks two years after surgery.

Conclusions

Post traumatic tremor is an extremely disabling condition and is generally resistant to medical therapy. We feel that carers of such patients should seek help from specialist centres for consideration of deep brain stimulation.

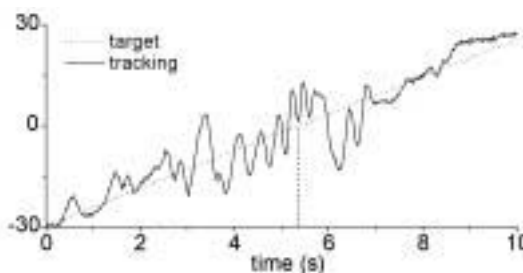


Figure 2: Above - Preoperative tracking. Below - Post-operative tracking. The traces from the visual guided tracking task illustrates the virtual loss of tremor after deep brain stimulation.

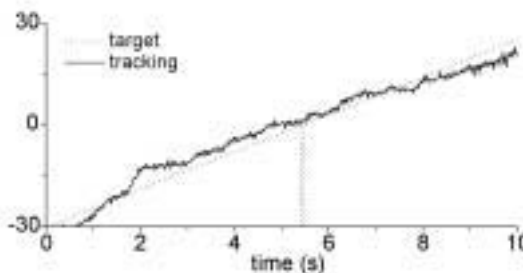
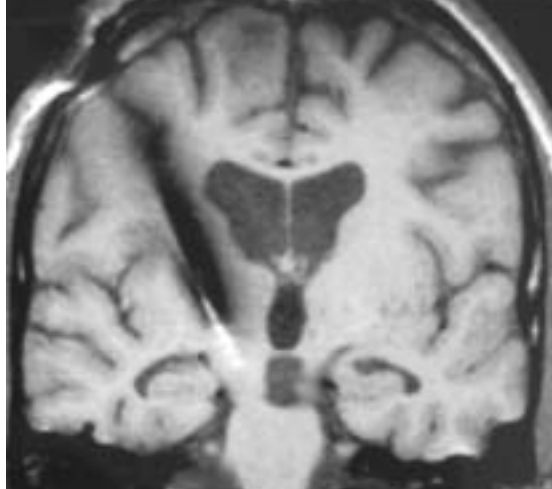


Figure 3: A coronal MRI showing the deep brain electrode in situ.



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