CHAPTER I

INTRODUCTION AND AIMS

The cerebellum has a unique relationship with cerebral cortex, thalamus, midbrain, and spinal cord (Ito, 1979). It does not only receive inputs from these structures, but also projects fibers to them through mono- or poly-synaptical pathways (Brodal, 1981). In fact, the cerebellum intimately involved in complex mechanisms which control somatic muscle length and tone (Cooper et al., 1976 ; Ebner et al., 1980; Schulman et al., 1987), gait (Hershler et al., 1989), posture (Sprague and Chambers, 1954), initiation and cortical input and output signals (Doudet et al., 1990). Consequently, neural integration at many different levels of the neuraxis might be altered by activation of different projections from the cerebellar nuclei and the output pathways of the cerebellum(Bantli et al., 1976). More specifically, stimulation of the cerebellar surface is assumed to activate a great number of Purkinje cells which are the inhibitory neurons to the cerebellar nuclei(Granit and Phillipp,1957).

This concept,leads to the use of electrical stimulation of the cerebellar cortex as a mean of initiating the inhibitory potential of Purkinje cell efflux in various neurologic diseases (Cooper, 1973 ; Cooper et al., 1973). Base on studies in monkeys and men, it was found that electrical stimulation of anterior lobe of cerebellar cortex produced a decrease in abnormal muscle tone (Cooper et al., 1973 ; 1976 ; Fisher and Penn,1978; Hemmy et al., 1977 ; Penn et al., 1978 ; Ebner et al., 1980). The decreased torque (measurement of resistance when a limb is passively moved) related to reduce in tonic and reflexly electromyogram (EMG) activities of muscle (Penn et al., 1978 ; Ebner et al., 1980 ; 1982).

Since the EMG can also be used to study the relationship between electrical activity and development of tension in muscle (Herman, 1970). Thus, this study is aimed to investigate the effects of electrical stimulation on different areas of anterior cerebellar cortex on EMG activities of triceps surae (gastrosoleus muscle) of substantia nigra-lesioned tree shrews. It is expected that electrical stimulation would decrease the muscle rigidity due to disinhibition of motor activity. In addition, this work defined the optimal stimulus parameters (i.e., frequency, duration and current intensity) and area of the cerebellar cortex which produces suppression of abnormal EMG pattern at rest after stimulation. This finding will expand the understanding of the effect of cerebellar electrical stimulation on

muscle tone in Parkinson's disease and may allow the procedure as a mean to decrease muscle rigidity in the Parkinsonian.