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The Optimal Position of the Coil Angle on Scurf by Using Transcranial Magnetic Stimulation on Biceps Branchii

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Abstract: The aim of the present study is to identify assess the potential of navigated transcranial magnetic stimulation (TMS) in studying neuronal reactivity for understanding human brain functions and to know the best optimal position of the coil angle on scurf to involuntary contraction biceps branchii. The experiment was done on eighteen healthy male students of physical education form Rostock University in Germany. P-Value= 0.001 that the value associated with statistical F less than 0.01 and we reject this hypothesis of zero to 1% level of significance .There are significant differences between the averages of three angles 0°, 45° and 90° coil angle on scurf. And the best optimal position of the coil angle on scurf by using transcranial magnetic stimulation on biceps branchii was 45°.

Key words: Transcranial magnetic stimulation ・Motor evoked potentials ・ Motor cortex

INTRODUCTION

Magnetic field can excite nerve was found by d'Arsonval in a process of observing the magnetic flash phenomenal in 1896. The magnetic stimulation was used on human brain and achieved to stimulate the nerve centre by Baker in 1985 [1].

The magnetic stimulator system was composed of a capacitance, static switches and a coil. An instant strong current passed the coil while the coil was placed over the prefrontal cortex to stimulate the related point [2, 3].

Motor evoked potentials (MEPs) elicited by transcranial magnetic stimulation (TMS) of the motor cortex were recorded in separate sessions to assess changes in motor cortex excitability [4].

Transcranial magnetic stimulation (TMS) of the human motor cortex provides a noninvasive method for studying the signal transmission along the central motor pathways. Changes in amplitude of the motor-evoked potentials (MEPs) in response to TMS provide a measure of changes in the excitability of the motor pathways from the presynaptic terminals on the cortical motor neurons to the neuromuscular junction. It is possible to increase the excitability of involved pathways intentionally, a process called facilitation. Facilitation increases the response rate, shortens the latency and enhances the amplitude of MEPs [5].

In more prolonged exercise during which fatigue is reached, the facilitation disappears and is replaced by a depression of the amplitude of the MEP [6].

The stimulator used in nerve stimulation was required to be more advanced, specially the position of the stimulating coil angle.

All subcortical projections from motor cortex (M1) derive from lamina V except the corticothalamic fibers from lamina VI and corticostriate projection III. It appears that there is a gradient within the pyramidal cells in laminas IV-VI whereby smaller cells in the higher levels project to the striatum and mid brain and the larger cells in the lower layers project to the brainstem and spinal cord. The largest pyramidal neurons project to the lumbar spinal motoneurons.

The columnar organization of cerebral cortex into functional groups of cells arranged in a radial fashion normal to the pial surface appears to be a general principal in cortical organization. It has its origins in the embryological development of the cortex whereby cells migrate with glial guidance from a primitive ectodermic plate and reach positions progressively nearer the cortical surface. The motor cortex is no exception [7].

MATERIALS AND METHODS

The experiment were done on eighteen healthy male students of physical education institute Rostock University (age 25.5 ± 1.2 SD, height 177.3 cm ± 4.4 SD, weight 71.9 kg ± 5.2 SD). The subjects received written and oral information about the procedures of the experiments before giving their written consent.

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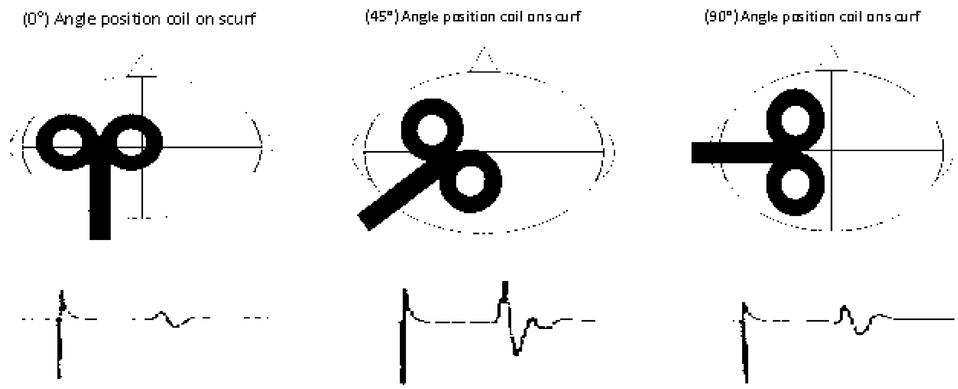

Fig. 1: The optimal position coil figure of eight MC-B70 on scurf average of three angles 0°,45° and 90°

General Setup: Subjects sat upright with elbow flexed in 110° position (Gad, M, 2011). 20 TMS trials impulses (magnetic gradient: 90 A/µs; pulse width: 280 µs; we had three angle position coil on the scurf: 0° 45° 90° every angle in different day) were administered with an open butterfly coil (type: MC-B70 by MagVenture). The motor evoked potentials were taken from the middle of the m. biceps brachii. A reference electrode was placed at the acromion by electromyography (EMG). Rest between 20 trials 10 sec. The amplitudes of the MEP statistical significance was proofed [8].

The subjects will make a warm-up for 10 minutes, after that take 2 minutes rest, subjects will set upright and start 20 TMS trials (magnetic grandient: 90 A/µs; pulse width: 280 µs; coil location:1) (0°) Angle position coil on scurf. 2) (45°) Angle position coil on scurf.3) (90°) Angle position coil on scurf (Fig .1),we could make every angle in difference day. The intensity of the magnetic stimulus was adjusted to 60-75 A/µs in magnetic stimulation equipment. And we will use the DIAdem 8.10 equipment to co-ordinate time between magnetic stimulation equipment and electromyography analyses motor evoked potential from peak to peak.

Tms Coils: The TMS coils used in this study were a specific version of the H-coil and a figure of eight coil (type: MC-B70 by MagVenture) (Fig.2). The H-coil version used in this study allows a comfortable placement above the hand motor cortex. The theoretical considerations and design principles of the H-coils are explained in our previous study [9, 10].

Safety Measurements: Since the H-coil was not used in previous clinical TMS studies, we asked the subjects to report any side effects including pain, anxiety or dizziness, changes in mood [11] and we performed cognitive and hearing tests before and after the TMS session. For the cognitive testing we used the CalCap computer program to test immediate and delayed memory as described previously [12].

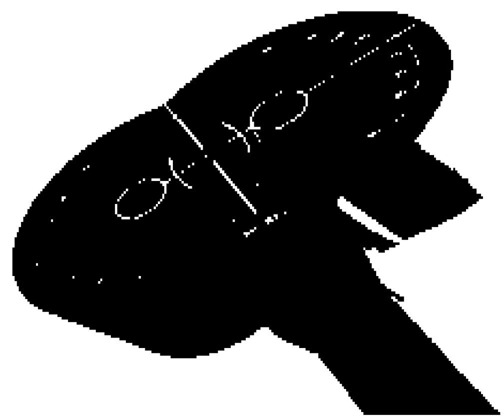

Fig. 2: TMS coil: figure of eight type MC-B70

Data Analyses: One-way repeated measures ANOVAs with planned contrasts were used to determine the statistical significance of the dependent variables. To answer specific questions related to timing of EMG amplitude form EMP and DIAdem 8.1 to analyses peak. Orthogonal planned contrasts were used. For a contrast to be orthogonal, the products of the weighted values must sum to zero. All significant correlations were positive. For all statistical tests alpha was equal to or below 0.01.

RESULTS AND DISCUSSION

None of the eighteen subjects who participated in the study reported any significant side effects after the TMS session.

Table 1: Dependent variable: EMP

	(I) Angle	(J) Angle	Mean Difference (I-J)	Std. Error	Sig.	99% Confidence Interval Lower Bound	Upper Bound
LSD	0°	45°	-1.07821*	.23271	.001	-1.7009	-.4555
		90°	-.30648	.23271	.194	-.9292	.3162
	45°	0°	1.07821*	.23271	.001	.4555	1.7009
		90°	.77173*	.23271	.002	.1491	1.3944
	90°	0°	.30648	.23271	.194	-.3162	.9292
		45°	-.77173*	.23271	.002	-1.3944	-.1491
Dunnett t (2-sided)[a]	45°	0°	1.07821*	.23271	.001	.3994	1.7570
	90°	0°	.30648	.23271	.323	-.3723	.9853

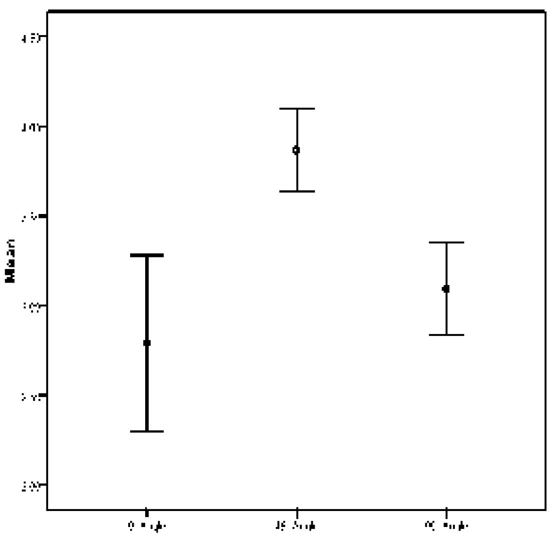

Fig. 3: Mean and standard deviation Angle position coil on scurf

P-Value=0.001 that the value associated with statistical F less than 0.01 and we reject this hypothesis of zero to 1% level of significance .There are significant differences between the averages of three angles (Fig. 3).

In fig.3 we can see the average and stander deviation of motor evoked potential MEP form electromyography EMG for biceps brechii (angle position coil on scurf 0° found 2.79± 0.99), (angle position coil scurf 45° was 3.87± 0.46) and (angle position coil scurf 90° found 3.09± 0.51).

It is noted that the use of his way LSD significant differences have emerged significance level of 1% between the averages of Angle 0°, Angle 45°and angle 90° processors, where the value of P-value or sig. less than 0 .01.

The test Dunnett t-test refers to the existence of significant differences the level of significance of 1% among the middle-way in the 0° angle, 45° angle and 0° angle, 90° angle (Table1).

By studying these results found the best optimal position of the coil angle on scurf by using transcranial magnetic stimulation on biceps branchii was 45°,Where it is the angle at which the highest average EMP 3.87± 0.46 (Fig. 3).

DISCUSSION

Motor cortical columns project to single muscles or small groups of muscles. The principle output cells are the large pyramidal cells in layer V and smaller pyramidal cells in layer III. Short-range inter-columnar connections are provided by a horizontal fibre network in layers IV and II. Longer-range connections occur in the more superficial horizontal fibre systems. Columns are some 300 mm in diameter and contain some 80-100 cells. Afferent inputs to cortex from thalamus and other cortical areas arrive in layers III and V. The stretching induced an increase of the averaged MEP amplitudes of about 117,0 ± 21,0%. These findings were significant [13].

There is some evidence the horizontal fibre systems have preferred orientations in area 4, tending to run in a direction at right angles to the precentral gyrus this is of interest when considering the results of experiment to determine the optimal orientation of figure- eight coils in stimulating the brain. And more proximal muscles the motor cortex in most easily excited by coil current running at right angles to the axis of the precential gyrus (Fig. 1). Indeed not only is the orientation of the current important, but also its direction. It has recently been shown using single motor unit recording that the preferred orientation for the generation of 11 waves it different from that 13 waves suggesting that different horizontal fiber system may be responsible for each.

The corticospinal tract contains in man some 1.1 million fibers, most of the fibers are of small diameter (<4 mm) only 2.6% are larger than 6 μm. the larger-diameter fibers probably derive from Betz cells which have been estimated to number 30000 in man the proportion of the corticospinal tract which is unmyelinated is undecided on the basis of electron microscopy in the cat estimated the number of unmyelinated fibers as less than 1%. Approximately 50% of corticospinal tract fibers originate from primary motor cortex. There are also important contributions from SMA about 20%. Cingulate motor cortex area about 10% premotor cortex about 5% and sensory cortex. The majority of corticospinal tract fibers reach the spinal cord, the remainder terminating in cranial nerve nuclei [7]. Then the best optimal position of the coil angle on scurf by using transcranial magnetic stimulation on biceps branchii was 45°. Undoubtedly, this study will improve the effective application of the TMS technology coil angle on scurf by using transcranial magnetic stimulation on biceps branchii.

CONCLUSION

The researcher concluded that the best optimal position of the coil angle on scurf by using transcranial magnetic stimulation on biceps branchii was 45°. Undoubtedly, this study will improve the effective application of the TMS technology coil angle on scurf by using transcranial magnetic stimulation on biceps branchii.

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