



Patterns of Hand Drift in Parietal Lobe lesion

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Abstract

Background: Clinical signs that help in detecting subtle weakness are invaluable in reaching early localisation of lesion and diagnosis. The parietal drift is a useful clinical Sign That Is Helpful In Localizing To The Parietal Lobe.

Objective

- 1) To characterize the parietal drifts which are observed on the basis of extent, direction, and hand and finger movements.
- 2) To study the association between the direction of the drift and the underlying causative lesion in the brain parenchyma.

Aim: To study the patterns of parietal drift in patients at tertiary care centre with a with diagnosed structural lesion in and around the parietal lobe.

Materials and Methods: Study conducted at a tertiary

care centre over a duration of 12 months from January 2017 to December 2017, where hand drift, fingers movement and any abnormal posturing of fingers and wrist were noted by the two expert assessors separately, for a period of 20-30 seconds each. The drift is described in each patient on the basis of following six parameters.1) Curling of fingers 2) Outstretching of thumb 3) Outward drift of hand 4) Upward drift of hand 5) Downward drift of hand 6) Pronation of hand

Results & Conclusions

1) Patients having lesions in parietal lobe demonstrated a hand drift (Parietal Drift) which consisted of hand movement in the outward, upward or rarely in downward direction.

2) Patients having lesion in the Parieto-occipital regions demonstrated a hand drift which consisted of hand

movement in the outward and upward direction

3) Patients having lesion in the Parieto Temporal regions. demonstrated a hand drift which consisted of hand movement in upward but NOT outward direction. 4) An attempt can be made to localize the site of lesion whilst awaiting radiological images by a simple characterisation of this clinical sign

Keywords: Parietal Drift, Parietal Lobe, Stroke

Introduction

Stroke is a major cause of morbidity and mortality in the world. With the advent of thrombolysis era, recognition of minor strokes becomes vital. The neurologist relies on the history and the neurological examination for diagnosis. Clinical signs that help detect subtle weakness are therefore invaluable in reaching early localisation of lesion and diagnosis. The Pronator Drift is a sign that has been well described in literature. It has been used to detect subtle hemiparesis. The parietal drift is a useful clinical sign to localize lesions in the parietal lobe. However there have not been much studies which study and characterize this drift. Hence we studied 45 patients with neurological disorder having lesions in the parietal lobe who Demonstrated The Parietal Drift.

Materials And Methods

This is a cross sectional and observational study conducted in patients having a hand drift and and a concomitant lesion in the brain, admitted in a tertiary care hospital in Mumbai.

Ethics committee permission

The study was initiated only after obtaining permission from the Institutional Ethics Committee.

Study population

All patients admitted i a tertiary care hospital in Mumbai who had a hand drift and and a concomitant lesion in the parietal lobe and/or adjoining cortex in the brain on imaging formed the study population.

Study duration

The study was conducted over a duration of 12 months from January 2017 to December 2017.

Eligibility Criteria

All patients satisfying all the inclusion criteria and none of the exclusion criteria were enrolled in this study .

Inclusion Criteria:

1. Patients of either gender aged between 5 years and 85 years admitted irrespective of their present and past medical history.
2. Patients who are willing to give a written informed consent. In minors who were not able to give consent, the consent was taken from the parent or guardian.
- 3) Patients having neurological lesion affecting parietal with or without surrounding areas of cortex on imaging (CT scan/MRI Brain imaging) in the past 1 year.

Exclusion Criteria:

- 1) Patients having weakness in upper limb with power < 4.
- 2) Patient having structural lesion elsewhere on imaging not including the parietal lobe.
- 3) Patients having any muscular lesion/disease which may affect the power/movement of the arms/forearms.
- 4) Patient not willing to give consent .

Sample size calculation

No formal sample size calculation was made for the study. We conducted a time bound convenient sampling technique during the study period of 12 months..

Study procedure:

After explaining the study procedure to the participants who fulfilled the screening criteria, written informed consent was obtained. Patients were examined in a well lit room. Patient was asked to stretch his arm out in the forward direction and keep it at the level of shoulder with eyes open. This evaluation was done by two individual assessors in department of neurology at the tertiary care hospital, well trained in assessing the characters of parietal

drift. Patients were asked to close eyes and hand drift, fingers movement and any abnormal posturing of fingers and wrist were noted by the two assessors separately, for a period of 20-30 seconds each.

The drift is described in each patient on the basis of six parameters.

- 1) Curling of fingers
- 2) Outstretching of thumb
- 3) Outward drift of hand
- 4) Upward drift of hand
- 5) Downward drift of hand
- 6) Pronation of hand

Statistical analysis

Data was entered in MS Excel and analysed using Graphpad InStat. Descriptive statistics was applied wherever applicable. The demographic data was expressed in mean \pm SD and descriptive statistics. The characteristics of parietal drift were marked as either present (+) or absent (-). Data of only those patients were considered for analysis whose parietal drift characteristics were same for both the assessors. Association between the site of lesion and the characters of parietal drift was done using chi-square test.

Discussion

Stroke is a preventable and treatable disease¹. It can present with the sudden onset of any neurological disturbance, including limb weakness or numbness, speech disturbance, visual loss or ataxia. Over the last two decades, a growing body of evidence has overturned the traditional perception that stroke is simply a consequence of aging which inevitably results in death or severe disability. Along with advancements² in acute treatment, evidence is accumulating for more effective primary and secondary prevention strategies, better recognition of people at highest risk and thus most in need of active intervention, interventions that are effective soon after the

onset of symptoms, and an understanding of the processes of care that contribute to a better outcome. Thus it becomes mandatory to detect stroke early and identify minor strokes as well.

The clinician relies on the history and the neurological examination to decide when radiological investigation is necessary. Clinical signs should therefore have the best possible combination of sensitivity and specificity. Standard textbooks describe the techniques of examination used to detect upper motor neuron dysfunction without information on sensitivity or specificity^{3,4}. The only information found in the literature pertains to the forearm roll⁵ and the carpal tunnel syndrome.⁶

The detailed segmental motor strength examination is widely used to determine presence or absence of lateralization on motor exam.^{3,4} This method of examination proves to be difficult even the weakness involved is subtle. Many patients with cerebral lesions involving the motor system will be missed if the segmental motor exam alone is used to rule out a subtle central motor abnormality.

Standard clinical tests to detect such dysfunction include downward drift of the outstretched arm (Barré test or arm drift), pronation of the outstretched limb (pronator test), impaired dexterity of repetitive fine finger movements (FFM), increased reflexes and up going toes and the segmental motor examination and forearm rolling test. A minor aberration can be used to diagnose a stroke.

Similarly, the parietal drift is a useful clinical sign when the neurological disorder involves a lesion in the parietal lobe.⁷

Distinguishing impaired spatial awareness from motor weakness is often difficult. Parietal lobe lesions specifically impair 'discriminative function', which encompasses both JPS and 2-point discrimination. Parietal drift⁸ reflects impaired JPS. It is 'considered specific for a

contra-lateral parietal lesion when the drift is up and outward, as a downward drift may also be the consequence of subtle motor weakness’.

There are several studies in the field of rehabilitation medicine, both older and more recent literature. Specialists perceived limb position awareness in terms of JPS. Recent evidence from investigation of patients with stroke, however, suggests that separate pathways may be involved for mediating kinaesthesia, the sense of body motion, as opposed to for JPS.⁹

Recently, a separate pathway for sensing body motion as a means of creating ‘awareness’ of the position of a limb has been postulated. Likely mechanisms have revealed that the entorhinal cortex, located in the medial part of the temporal lobe, has a variety of specific cells, which gives rats an ‘internal sensing’ system of spatial awareness (‘place cells’), direction (‘grid cells’), and speed of movement (‘speed cells’) for which the Nobel Prize in Physiology or Medicine (2014) was shared by John O’Keefe (London, UK) and Edvard and May-Britt Moser (Denmark).¹⁰⁻¹⁴ Finally, a further cell type has recently been identified which allows rats to know their position when still.¹⁵

The Pronator Drift is a sign that has been well described in literature. It has been used to detect subtle hemiparesis. The parietal drift is a useful clinical sign to localize lesions in the parietal lobe. However there have not been much studies which study and characterize this drift.

The observations in our study include:

- 1) All the patients enrolled in the study having a neurologic disorder with parietal lobe lesion on imaging demonstrated a hand drift.
- 2) Hand movement in the drift included movements in the outward, upward or rarely in downward direction.

- 3) Apart from hand movement, curling of fingers and outstretching of thumb was also seen in some patients however a statistical significance was not seen.
- 4) There was significant positive association seen of outward movement as well as upward movement of hand in Parieto Occipital region (0.02 and 0.02 respectively).
- 5) Similarly, there was near significant negative association seen of outward movement of hand in Parieto Temporal region (0.059). There was a trend towards positive association of upward movement of hand in Parieto Temporal region (0.16). However it was not statistically significant.
- 6) There was significant negative association seen of upward movement of hand in pure parietal lobe lesions (0.03). There was positive association seen of downward movement of hand in parietal lobe lesions. However here the sample size was too small (5 patients).

Thus we can conclude that these findings can help us to localize a lesion in a patient with subtle motor deficit before radiological demonstration of the lesion. This study also proves invaluable in rapid diagnosis as the test is easily performed and findings too are easily evident.

Summary and Conclusions

The present study studied the characteristics of the parietal drift in patients admitted at tertiary care centre with a diagnosed neurologic disorder. The results of the study showed that

- 1) Patients having lesions in parietal lobe or the parietal lobe and adjoining regions demonstrated a hand drift called as the Parietal Drift which consisted of hand movement in the outward, upward or rarely in downward direction.
- 2) Patients having lesion in the Parieto-occipital regions demonstrated a hand drift which consisted of hand

movement in the outward and upward direction

- 3) Patients having lesion in the Parieto Temporal regions. demonstrated a hand drift which consisted of hand movement in upward but NOT outward direction.
- 4) An attempt can be made to localizing the site of lesion whilst awaiting radiological images by a simple characterisation of this clinical sign.

Legend to Tables:

Table 1: Association of Outward Movement with Parieto-temporal Lesions

Table 2: Association of Outward Movement with Parieto-Occipital Lesions

Table 3: Association of Upward Movement with Parieto-occipital Lesions

Table 4: Summary of Findings

Table 5: P value- significance between site of lesion and hand movement

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Tables

Table 1: Association of Outward Movement with Parieto-temporal Lesions		
	Outward Movement +	Outward Movement -
Parieto-temporal only	6	4
Other lesions	31	4
P value	0.059, considered near significant negative association by chi-square test	

Table 2: Association of Outward Movement with Parieto-Occipital Lesions		
	Outward Movement +	Outward Movement -
Parieto-occipital only	21	1
Other lesions	16	7
P value	0.02, considered significant positive association by chi-square test	

Table 1 shows there was near significant negative association seen of outward movement of hand in Parieto Temporal lesions (0.059).

Table 2 shows there was significant positive association seen of outward movement of hand in Parieto Occipital lesions (0.02).

Table 3: Association of Upward Movement with Parieto-occipital Lesions		
	Upward Movement +	Upward Movement -
Parieto-occipital only	21	1
Other lesions	16	7
P value	0.02, considered significant positive association by chi-square test	

Table 3 shows there was significant positive association seen of upward movement of hand in ParietoOccipital lesions (0.02).

Table 4 (Summary Of Findings)

Site of lesion on imaging	Curling of fingers	Outstretching of thumb	Outward mvmt	Upward mvmt	Downward mvmt	Pronation
TOTAL POSITIVE	31	30	37	37	5	14
Parietal	10	5	10	6	4	3
Parieto-temporal	7	9	6	10	0	3
Parieto-occipital	14	16	21	21	1	8

Table 4 is a summary of the number of patients observed with hand drift versus the site of lesions involved.

Table 5 (P Values)

Site of lesion on imaging	Curling of fingers	Outstretching of thumb	Outward mvmt	Upward mvmt	Downward mvmt	Pronation
Parietal	0.72	0.016	0.67	0.03	0.01	0.72
Parieto-temporal	0.85	0.12	0.059	0.16	0	1
Parieto-occipital	0.53	0.53	0.02	0.02	0.34	0.53

Table 5 mentions the p value showing significance between the hand movements and site of lesions

Declaration of Conflict of Interest

The author declares no conflict of interest in the above study.