Short report

Tactile sensibility in parietal lesions

RICHARD TEGNÉR

From the Department of Neurology, Karolinska Hospital, Stockholm, Sweden

SUMMARY The response to tactile stimuli at the threshold range was studied with a forced choice technique in two patients with stable parietal lesions. The most unexpected finding was that very weak stimuli were significantly better detected on the side contralateral to the lesion. The psychometric functions were also less steep and reached a ceiling at below 100% correct responses. The findings are interpreted as due to the combined effect of decreased sensitivity to alterations in stimulus strength and decreased local attention.

According to classical doctrines, lesions of the parietal lobe cause little impairment of simple sensory modalities but mainly affects discriminative sensory functions.¹⁻³ Tactile stimuli at the normal threshold level can be felt but the responses are irregular: "When graded tactile stimuli are applied it is found that the proportion of correct responses is not directly related to their intensity, but naturally the proportion increases as the strength of the stimulus is increased."⁴

Due to the variability, this impairment is often attributed to hysteria.⁵ In the present study, tactile sensibility was examined in two patients with stationary parietal lesions. A modern psychophysical method was used that identifies changes in the patients' response criterion.^{6,7}

Patients

The study was of two men, 42 and 73 years of age, who both had sustained infarctions of the right parietal lobe. They were selected for more detailed examination since they had normal tactile thresholds as measured with von Frey hairs according to the method of limits⁸ but still failed to detect a few stimuli that appeared to be clearly suprathreshold. The latter finding is somewhat similar to what is seen in hysterical patients.

Diagnoses were substantiated by CT. They were examined 6 and 3 years after stroke, respectively. Postural sensibility and stereognosis were markedly impaired in the left hand. Vibratory sensibility was normal. The younger patient spontaneously described touch with a piece of cotton wool and light pin prick as less distinct on the left side.

Methods

To test for light touch calibrated von Frey hairs were used.

Address for reprint requests: Richard Tegnér, Department of Neurology, Karolinska Hospital, Box 60 500, S-104 01 Stockholm, Sweden.

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Measurements were made on the thenar eminences. Each patient was first tested on the normal side and this was again examined at the end of the experimental session to exclude a failure of general attention. A short pretest indicated the appropriate stimulus strengths to be used in further testing. Patients were told they would hear a sound and then either be touched by a hair or not, which they should report as "yes" or "no". Testing comprised a random series of blocks, within each of which the same von Frey hair was used for 10 stimuli randomly interspersed with 10 null stimuli. A total of 40 trials were made with each von Frey hair and on each side. From

Fig Tactile sensitivity measured with von Frey hairs. (a) Parietal infarction, Case 1. (b) Parietal infarction, Case 2. (c) Thalamic infarction. (d) Hysterical hypaesthesia. Normal side o, abnormal side ●. Stimulus intensity in decibels with 1 g as reference.

observed frequencies of "yes" responses on stimuli ("hits") and on null stimuli ("false alarms"), A' was calculated. This is a measure of sensitivity which is independent of patient's response criterion^{6,7} (that is, how eager the subject is to make a hit or how reluctant he is to make a false alarm). A' usually takes values between 0.5 and 1 where 1 means 100% correct responses.

Results

On the normal side, both patients with parietal lesions had low thresholds and the number of correct responses increased steeply with increasing stimulus strength (see figure). This indicates that general attention was good. On the abnormal side, A' increased steadily with increasing stimulus strength up to a ceiling at $A' = 0.96-0.98$. For very weak stimuli, A' was actually greater on the abnormal side (both $p < 0.05$, χ^2 test) but then increased more slowly to become equal on the normal and abnormal sides at about $A' = 0.75$ in case 1, and at about $A' = 0.95$ in case 2 (fig). Both patients had false alarm rates below 0.2 and with no side differences.

The figure also shows the markedly different responses from a hysterical patient and a patient with a thalamic lesion.

Discussion

The exact extent of the patients' cerebral lesions is not known and the findings have to be discussed in general terms. Clinical findings vary considerably in parietal lesions which makes it particularly important to evaluate case studies with caution.⁹

About 10% of the tactile stimuli were not identified independent of the stimulus strength. This accords with earlier observations,^{2,3} and explains the superficial similarity to hysteria. According to Head,³ the phenomenon is due to a defect in local attention.³ Note that both patients had right hemisphere lesions where unilateral attentional deficits are more severe and long-lasting than after left-sided lesions.¹⁰

The psychometric functions at the threshold range were less steep than on the normal side. This is sometimes observed in thalamic and peripheral nerve lesions but it is then accompanied by a raised threshold. Both man^{2,3,11} and animal¹² can detect tactile stimuli after extensive parietal lesions even if the threshold may be raised. Detection of stimuli may therefore rather depend on diffuse thalamocortical and reticular activating systems.^{12,13} If this is correct, release from descending cortical inhibition may

explain why very weak stimuli were better detected on the abnormal side.

Since a more shallow psychometric function means a decreased sensitivity to alterations in stimulus strength, the present finding accords with the concept that parietal lesions cause defects in the differentiation and synthesis of primary sensory modalities.¹⁴

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