SUMMARY The reappearance of developmental reflexes in the aged has been found to be associated with severe, diffuse cerebral damage. This study examined the relationship between the presence of such reflexes in stroke patients and the outcome of rehabilitation. Tests for the presence of snout, suck, jaw-jerk and palomential reflexes were tested in 106 consecutive stroke patients admitted for rehabilitation treatment. A mental status test was also included in the usual medical admission examination. Functional status ratings for self-care and mobility at discharge, and the setting to which the patient was discharged, were used as outcome criteria. All of the reflex signs were negatively related to a favorable outcome, but the correlations were not high enough for predictive value. The mental status measures were more highly related to rehabilitation outcome than were the presence of developmental reflexes.

PAULSON AND GOTTLIEB\(^1\) have observed that demented senile patients may exhibit a number of primitive neurological reflexes which are also present in the earliest stages of ontogenetic development. In this group of related responses they examined 7 reflexes seen in aged populations which also occur during normal fetal development. It was their opinion that the reappearance of such reflexes in the aged is almost always attributable to diffuse, bilateral and irreversible CNS disease.

The glabellar tap reflex has been considered a sign of Parkinsonism, but Pearce, Aziz and Gallagher\(^2\) demonstrated the existence of an exaggerated response not only in Parkinsonism but also in a group of patients with other cerebral pathology. They concluded that the reflex was a nonspecific sign of extensive cerebral destruction. Klawans and Goodwin\(^3\) found that a positive glabellar response was reversible with L-dopa therapy in a group of patients with Parkinsonism. The failure of an L-dopa regimen to reverse the reflex in patients with clinical evidence of organic dementia led these authors to conclude also that the exaggerated glabellar response might result from diffuse cortical disease.

While there is some agreement that the presence of developmental reflexes in older adults may be indicative of widespread cortical damage, the utility of such signs for diagnosis is far from settled. One problem in the examination of the aged is whether abnormal neurological signs are the result of pathology or are the consequences of normal aging. Critchley\(^4\) has looked at both sides of the controversy. He cautions that standards of normality are different in the aged from those in adulthood; certain neurological changes of the CNS.

The presence of primitive reflexes in the aged seems to be associated with the lack of inhibitory mechanisms in higher centers. They have been seen frequently in patients with severe, diffuse, cerebral damage. The fact that some responses have also been observed in populations without any other manifestation of neurological abnormality introduces a note of caution about whether all such reflexes should be viewed as a sign of serious CNS pathology. The possibility exists, however, that individuals exhibiting these reflexes may have a diminished capacity for learning. If such were the case, it might be possible to predict a patient's response to rehabilitation treatment. The purpose of this study was to examine the relationship between the presence of developmental reflexes in a group of stroke patients and their progress in rehabilitation.

**Method**

Four developmental reflexes frequently seen in aged populations were selected for study: snout, suck, jaw-jerk and palomental. Tests for the presence of these responses, along with those routinely performed for left and right extensor-plantar reflexes, were included in the usual medical admission examination for 106 consecutive stroke patients. The reflex response was graded as absent, present or strongly present. The palomental response was graded as absent, present or strongly present. The palomental response was graded as absent, present or strongly present. The palomental response was graded as absent, present or strongly present.

A simple mental status examination was also administered to all patients without aphasia. Of the 106 patients, there were 29 who were aphasic and 77 who were able to communicate verbally. The mental status test consisted of 2 parts. In the orientation section there was 1 ques-
tion each regarding time, place and person (3 points). In
other cognitive tests, there were 2 subtractions of 7’s from
100 (3 points), naming the last 4 presidents (4 points), and
interpretation of 2 proverbs (2 points).

Two kinds of data were used as measures of rehabilita-
tion outcome: functional status ratings at discharge and dis-
charge destination. Ratings at admission and discharge for
11 tasks of self-care and mobility were given by physical and
occupational therapists working with the patient. The tasks
were: eating, personal hygiene, grooming, bowel function-
ing, bladder functioning, bed activities, dressing, transfers,
wheelchair activities, ambulation on level surfaces, and the
use of stairs. A rating scale with values from 1 to 4 was used:
1 — completely dependent, 2 — requires physical assistance,
3 — requires supervision only, and 4 — completely indepen-
dent. The functional status score was the sum of the 11
ratings with a possible maximum of 44.

Discharge destination was ranked according to a
hierarchy of independence: 1 — alone in a private residence,
2 — with someone else in a private residence, 3 — in a
custodial care facility or boarding home, 4 — in a skilled
nursing facility, or 5 — in a hospital.

The sample of 106 patients ranged in age from 30 to 88
years with a mean of 68.7 years. There were 48 males and 58
females. The average length of stay for their rehabilitation
program was 35 days, very close to that in a sample of 1,443
stroke patients in 20 rehabilitation hospitals reported by
Keith, Breckenridge and O’Neil.10

Results

In the distribution of reflexes (table 1) there was an
average of 32.8% graded as present or strongly present. The
snout reflex was most common, in 51.5% of the patients. The
incidence is very close to that found by Paulson and
Gottlieb,1 although their sample was comprised of patients
with senile dementia. The suck reflex, observed by these in-
vestigators in 53% of their patients, was present in only
19.4% of stroke patients. The jaw-jerk response was seen
somewhat more frequently in the present study 31.0% to
18% in the Paulson and Gottlieb population. The presence of
the palomental reflex was fairly similar in the 2 studies,
25.7% to 21%. Otomo6 reported a much higher incidence of
this response (70%) in a group of hemiplegic and hemiparetic
patients. In the present study, an extensor plan-
tar response (Babinski) was present on either side in about a
third of the cases.

The relationship between the presence of reflexes and out-
come criteria was analyzed by means of Kendall’s tau, a
rank order correlation appropriate for ordinal data.11 Table
2 is a summary of that analysis. It is apparent, first of all,
that all of the reflex signs are negatively related to a
favorable outcome on either functional status or discharge
destination. On the other hand, the sizes of the correlations
for any of the reflexes or their total are low. The snout and
palomental reflexes are most strongly related to both
criteria, but the magnitude of the relationship is not high
enough to be of much predictive value.

Table 3 shows the association between reflexes and the
two sets of mental status measures: orientation and other
cognitive tests (serial 7s, names of presidents and proverb in-
terpretation). Although the various reflexes are all
negatively related to mental status measures, only 2 of the
correlations are even weakly significant. In this study there
is virtually no relationship between reflex signs and perfor-
mance on mental status examinations.

In Table 4 the fairly strong correlations between the 2
mental status measures and functional status at discharge
are the highest associations of the study. The mental tests
are also related to discharge destination but not as well. The

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**TABLE 2** Distribution of Reflexes in 106 Stroke Patients

<table>
<thead>
<tr>
<th>Reflex</th>
<th>Absent</th>
<th>Present</th>
<th>Total mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suck</td>
<td>83</td>
<td>80.6</td>
<td>69.7</td>
</tr>
<tr>
<td>Snout</td>
<td>50</td>
<td>48.5</td>
<td>67.2</td>
</tr>
<tr>
<td>Jaw-jerk</td>
<td>69</td>
<td>69.0</td>
<td></td>
</tr>
<tr>
<td>Palomental</td>
<td>78</td>
<td>74.3</td>
<td></td>
</tr>
<tr>
<td>Extensor-plantar, left</td>
<td>69</td>
<td>65.7</td>
<td></td>
</tr>
<tr>
<td>Extensor-plantar, right</td>
<td>69</td>
<td>65.0</td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 3** Relationship between Reflexes and Mental Status Measures

<table>
<thead>
<tr>
<th>Reflex</th>
<th>Orientation</th>
<th>Other cognitive measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suck</td>
<td>-.13***</td>
<td>-.09***</td>
</tr>
<tr>
<td>Snout</td>
<td>-.06**</td>
<td>-.11**</td>
</tr>
<tr>
<td>Jaw-jerk</td>
<td>-.03**</td>
<td>-.01**</td>
</tr>
<tr>
<td>Palomental</td>
<td>-.11***</td>
<td>-.19*</td>
</tr>
<tr>
<td>Extensor-plantar, left</td>
<td>-.09</td>
<td>-.04</td>
</tr>
<tr>
<td>Extensor-plantar, right</td>
<td>-.06</td>
<td>-.00</td>
</tr>
</tbody>
</table>

---

*Significant at the .05 level.
**Significant at the .01 level.
TABLE 4  Relationship between Mental Status Measures and Outcome Criteria

<table>
<thead>
<tr>
<th>Mental status measures</th>
<th>Average functional status at discharge</th>
<th>Outcome</th>
<th>Discharge destination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tau</td>
<td>p</td>
<td>Tau</td>
</tr>
<tr>
<td>Orientation</td>
<td>.35**</td>
<td>.001</td>
<td>.23**</td>
</tr>
<tr>
<td>Other cognitive measures</td>
<td>.48**</td>
<td>.001</td>
<td>.26**</td>
</tr>
<tr>
<td>Aphasia</td>
<td>-2.5**</td>
<td>.006</td>
<td>.03</td>
</tr>
</tbody>
</table>

**Significant at the .01 level.

The presence of aphasia is negatively correlated to functional ability but bears no relation to discharge destination. From these data it is apparent that a series of simple mental status tests are better predictors of functional status at discharge than are reflexes. While the setting to which a patient is discharged is probably roughly associated with his or her physical and mental condition, other factors such as family support also influence placement.

Discussion

Stroke patients make up the largest category of patients seen in rehabilitation hospitals, comprising 31% of all discharges in a recent study involving 20 hospitals. A major consideration in the selection of such patients for treatment directed at regaining lost functions or learning new activities is the extent to which these individuals are able to profit from treatment. Traditionally, the neurological examination has been used to establish lesion site and diagnosis, and to associate examination findings with function. In the present study the attempt was made to relate neurological abnormality to future functional expectations. More specifically, an inquiry was directed at the relationship of developmental reflexes at admission to performance of self-care and mobility tasks after a course of rehabilitation therapy.

Several studies have found developmental reflexes in older populations. While some of these groups exhibited severe cerebral pathology, others were composed of individuals without other evidence of neurological abnormality. The present investigation demonstrates that such reflexes are common in those stroke patients who are selected for inpatient rehabilitation. The presence of developmental reflexes was found to be negatively related to favorable treatment outcome. The strength of the relationship was too small to be useful in the selection of patients or the prediction of outcome. A research design which does more than examine the presence of reflexes at one time might better establish their predictive nature in relation to directed motor activity.

References


Disappearing Carotid Defects

PHILIP YARNELL, M.D., MICHAEL EARNEST, M.D., GLENN KELLY, M.D., AND BOB SANDERS, M.D.

SUMMARY Large intraluminal cervical carotid artery filling defects consistent with mural thrombi were angiographically demonstrated during acute hemispheric neurologic emergencies. These thrombi disappeared benignly as shown by serial angiography in 2 patients treated with intravenous heparin and spontaneously in 1 patient treated surgically. Thus, partially obstructing cervical carotid artery thrombi may lyse either with the use of anticoagulant therapy or else spontaneously.

The etiology of the thrombi may partly be related to underlying atheromatous disease.

CAROTID ARTERY DISEASE is a common cause of cerebral dysfunction. Pathophysio logically, carotid stenosis, occlusion, ulceration, dissection, inflammation, mural thrombus and trauma have all been implicated. A large intraluminal carotid artery filling defect shown by arteriography suggests a thrombus. The imminent danger of such a clot is either distal embolization or progression to occlusion. The neurologic symptoms and signs may be related to either regional flow insufficiency or embolization or both. Discovery of an intraluminal lesion requires immediate decisions about treatment.

We have recently treated 3 patients with large intraluminal carotid defects and probable distal embolization. Two were treated with anticoagulation and the third had surgical exploration. In all 3 cases the presumed carotid clot

From Denver General Hospital, University of Colorado Medical School, Denver, CO 80204. Drs. Yarnell and Earnest are from the Department of Neurology; Dr. Kelly is from the Department of Surgery and Dr. Sanders from the Department of Radiology.
Relationship between primitive reflexes in stroke patients and rehabilitation outcome.
J G Botvin, R A Keith and M V Johnston

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