APHASIA AND KINDRED DISORDERS OF SPEECH

IN TWO VOLUMES
VOLUME II

APHASIA

AND

KINDRED DISORDERS OF SPEECH

BY

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INTRODUCTION

THROUGHOUT the previous volume examples of disorders of speech have been cited, presenting various forms and due to diverse causes. This volume is devoted to a series of clinical reports of illustrative cases arranged in numerical order. Each number corresponds to that employed to designate the patient throughout all my papers on this subject[1]. But, in order not to multiply these reports unnecessarily, I have omitted the records of certain cases in the series, which either failed to illustrate any new point, or were in some way incomplete. Thus, although the numbers run from 1 to 26, no account is given of No. 3, No. 12 and No. 16.

In most instances these reports represent drastically reduced versions of voluminous clinical records extending over considerable periods of time. Several of these patients have been under my care for some years and I have been compelled by exigencies of space to omit many observations of much interest, especially when they simply confirmed those made on some previous occasion.

Each case illustrates some one or more aspects of the problems dealt with in the previous volume and, in order that the reader may have some guide to their contents, I have summarised them shortly under the following descriptive headings.

§ 1. GRAVE DISORDERS OF SPEECH

When the disturbance of symbolic formulation and expression is acute in onset or unusually profound, the loss of capacity to employ language may be extremely gross. Speech is reduced to "yes" and "no" together with a few emotional expressions. The patient fails to understand exactly what is said to him and cannot execute any but the simplest oral commands. He is unable to read to himself with pleasure and fails to carry out orders given in print. Writing, whether spontaneous or to dictation, is affected, and printed matter cannot be copied in cursive script. The tests with the alphabet usually suffer severely and the patient finds it impossible even to arrange the block letters in due order. The free use of numbers may be gravely restricted and, in some instances, he cannot solve arithmetical problems, or indicate the relative value of two coins with uniform accuracy.

Such cases conform more or less to the type usually spoken of as "Broca's Aphasia." But the loss of function varies profoundly in degree. Should it be still more gravely diminished, the patient may be reduced to a condition of organic dementia in which it is impossible to carry out any systematic examination; for he is then deprived of almost every means of reproducing his mental processes in propositional terms both for internal or external use.

[1] [63], [64], [65].

On the other hand, a severe case of acute aphasia, such as No. 20, may pass in the course of recovery through a stage in which the defects are confined to acts of verbalisation. On the other hand, exactly opposite changes may occur in patients who are suffering from progressive organic lesions of the brain.

No. 26 (see p. 394) was a case of extremely severe aphasia of vascular origin in an unusually intelligent man of sixty. Speech was reduced to meaningless sounds with "Si, si" used correctly for affirmation. He could repeat nothing. He understood what was said to him and chose familiar objects correctly, although he could not execute more complex oral commands. He read to himself with pleasure and selected common objects slowly but accurately when shown their names in print; but he failed to execute more difficult printed orders. He could write nothing spontaneously, except his name and the first nine numerals; yet he could copy correctly, provided he was not compelled to transcribe print into cursive script. The use of the alphabet was defective; even when given twenty-six block letters he failed to arrange them in order. Arithmetical exercises were impossible and he could neither name coins nor express the simplest relation between any two of them. Orientation was not affected. Games, except draughts, were difficult or impossible. He enjoyed music and could sing without words. Vision was unaffected and there were no abnormal physical signs in the nervous system.

No. 21 (see p. 320) was a case of severe aphasia due to a vascular lesion in an elderly man. When first examined by me four days after the onset of the stroke, he was speechless except for "yes" and "no" together with a few emotional expressions. He could not say or repeat his name. He understood much of what was said to him, provided it did not convey an order, and seemed to comprehend the meaning of simple words in print. Writing was profoundly affected. There was no disorder of motion or sensation and the reflexes were normal. Vision was unaffected. The arterial tension was grossly raised and the vessel wall thickened.

He remained in fundamentally the same condition, and, eight and a half years after the seizure, I was able to make a complete examination with the following results.

He was still speechless, except for "yes" and "no" and a few automatic expressions. He could not repeat anything said to him, even "yes" and "no." He understood most of what he heard, choosing common objects and colours correctly to oral commands; yet he failed to execute more complex tasks, such as setting the clock and the hand, eye and ear tests. He could read nothing aloud and had difficulty in understanding what he read to himself; but he chose familiar objects to printed commands and on several occasions succeeded in selecting a printed card which bore words corresponding to the colour or to the simple pictures he had just seen. Thus, it is obvious that printed words conveyed some meaning to him, provided they did not imply a command. He could write nothing but his surname spontaneously, failed altogether to write to dictation and could not copy print in cursive script. He was unable to say, to repeat, to read or to write the alphabet. He succeeded in writing some of the letters to dictation and copied them with four errors only. He counted with extreme difficulty and failed to reach twenty. Simple problems in arithmetic puzzled him greatly, but he was able to indicate on his fingers with remarkable accuracy the relative value of two coins.

No. 1 (see p. 1) was a case of extremely severe aphasia, due to an extensive gun-shot injury of the left half of the head. The missile entered in the fronto-temporal and made its exit in the temporo-parietal region; at this point there was a small hernia cerebri (Fig. 15).

There was profound right hemiplegia, in which face and tongue participated; the upper extremity was flaccid, the lower hypertonic.

At first he was completely speechless except for "yes" and "no" and he could not repeat even these monosyllables. He understood much of what was said to him, but was unable to execute simple oral commands with certainty. He could not read and failed to carry out orders given in print; yet he was able to point to the word on a list which expressed the object he desired. At first he wrote nothing but his surname and a scrawl, which somewhat resembled one of his Christian names. Copying from print was impossible.

He recovered power rapidly and it then became obvious that his defects of speech were mainly of the Verbal type. He talked slowly and with obvious difficulty. When repeating anything said to him, his articulation, though defective, was better than with spontaneous speech. He understood all that was said and executed even complex oral commands correctly. Although he succeeded in carrying out printed orders, he still failed to comprehend exactly what he read to himself owing to defects of internal verbalisation. He wrote badly, employing the left hand because the right was powerless; not only was the act of writing difficult, but the words were badly spelt. To dictation the faults were of the same character though less gross. He could, however, copy print perfectly in cursive script, evidence that the defect was intellectual rather than mechanical. He was unable to say the alphabet spontaneously and had great difficulty in writing the letters in due sequence. In spite of his University education, he was puzzled by simple arithmetical problems. Orientation was in no way affected and he drew from memory a perfect ground-plan of his ward at the hospital. He could play simple card games, but not bridge; puzzles he enjoyed and solved with ease.

No. 20 (see p. 295) was a case of acute and severe aphasia in an elderly woman due to the removal of an extra-cerebral tumour, growing from the dura mater, which indented the brain around the meeting point of the inferior frontal and inferior precentral fissures.

The operation was followed by flaccid right hemiplegia, loss of movement in the same half of the face and tongue, together with the usual changes in the reflexes on the paralysed side. At the expiration of sixteen days all abnormal signs had passed away and there was no difference between the two halves of the body.

The loss of speech was at first profound and she could say "yes" and "no" only. The acts of speaking, reading and writing were all affected at first; even the power of understanding what was said to her was somewhat disturbed.

As she regained her capacity to use language, those aptitudes returned first which were least dependent on accurate word-formation. Clinically, within four months of the operation, she had been transformed from a severe example of loss of speech into one of Verbal Aphasia, so slight that it might have been mistaken for an articulatory disturbance only.

§2. SPECIFIC FORMS OF APHASIA

No two examples of aphasia exactly resemble one another; each represents the response of a particular individual to the abnormal conditions. But, in many cases, the morbid manifestations can be roughly classed under such descriptive categories as Verbal, Syntactical, Nominal or Semantic defects of symbolic formulation and expression.

(a) *Verbal Aphasia.*

The characteristic manifestations, which I have called Verbal defects, consist mainly of inability to discover the exact form of words and phrases necessary for perfect external or internal speech, together with want of power to transform them into written characters. Although verbalisation is profoundly affected, it is obvious that the patient can recognise names. For he chooses an object or colour in response to a printed order and, when shown some particular object, can select its name in print. Capacity to execute oral and printed commands is on the whole preserved unless the disturbance is severe. The patient can usually understand what is said to him in conversation or what he reads to himself, provided the sentences are not unduly long and complicated. But he cannot write spontaneously with ease and his spelling shows the same errors of verbal formation that are so evident in articulated speech. There is often extreme difficulty in transcribing print into cursive script. Numbers are grossly defective; yet he can recognise and express in some roundabout way the relation between coins of different value and has no difficulty with money. Orientation is not affected; he can usually construct a ground-plan of some familiar room. The power of playing games is not disturbed, although the defects of articulated speech may make it difficult to express the score.

The slighter the loss of function, the more closely does the disorder appear to be one of articulation. But spontaneous writing always shows defects of the same order as those of external speech. Moreover, the power of employing block letters in various ways to compose an alphabet or to form words is usually affected, showing that the fault lies in verbalisation and is not in origin simply "motor," "mechanical" or even purely "anarthric."

No. 6 (see p. 76) was a case of Verbal Aphasia, due to a gun-shot injury over the anterior portion of the left precentral gyrus, extending downwards on to the inferior frontal convolution (Fig. 7, Vol. I, p. 445).

There were no abnormal signs in the nervous system, except a transitory weakness of the right half of the lower portion of the face and some deviation of the tongue to the same side.

Four days after he was wounded he was speechless, but he soon began to utter a few badly articulated words. His power of speaking rapidly improved and throughout it was verbal structure and not nomenclature that formed his main difficulty. He could understand what was said to him and commands exacting a single choice were carried out accurately; but, as soon as two of these orders were combined, his response became slow

and hesitating. Comprehension of printed phrases was obviously defective. Although he rapidly recovered the power of writing his name and address correctly, he could not write that of his mother with whom he lived. He was unable to count, but wrote the numbers up to twenty-one. Orientation was not affected. He drew well spontaneously and to command.

Seven years and eight months later, he had regained his power of carrying out all the serial tests, but still remained a typical example of Verbal Aphasia. He hesitated in finding words to express his thoughts, the pauses were unduly frequent and prolonged, and enunciation was defective. He could read aloud intelligibly, but stumbled at the longer words and complained that, when reading to himself, he was obliged to go over the same passage twice before he could grasp its meaning. As he said the words to himself silently, he was liable to mispronounce them and this confused him. In the same way, although he could write an excellent letter unaided, he did so slowly. He still failed to say or write the alphabet perfectly and even hesitated in putting together the twenty-six block letters; but he could repeat the alphabet after me, read it aloud and write it correctly to dictation. He counted slowly without mistakes, though articulation was somewhat slurred. He solved all the problems in arithmetic, except the most difficult of the subtraction sums, and he had no trouble with money. He drew excellently and produced a perfect ground-plan of the room in which we worked. He could play all games correctly.

Thus, the difficulty throughout lay with verbal construction, whether for external or internal speech, rather than with verbal meaning.

No. 9 (see p. 124) was a case of grave Verbal Aphasia due to an extensive gun-shot injury in the left parieto-occipital region. This produced profound right hemiplegia, both motor and sensory, with gross hemianopsia.

His speech was reduced to little more than the use of "yes" and "no" and he could not even pronounce his own name correctly. He had extreme difficulty in finding the names of common objects and colours, but the sounds he uttered bore a distinct relation to the words he was seeking. When he attempted to repeat what was said to him, articulation was extremely defective. His comprehension of single spoken words was good and he executed oral commands, provided they did not necessitate elaborate choice. He could select a familiar object in response to its name in print, but was slower and less certain with colours and failed grossly with the more complex tests. He wrote his own name, but could not add his rank, regiment or address, and was unable to write down the names of common objects. He could copy printed matter in capitals only. These defects of writing were not due to mechanical inability to form the letters, but rather to a difficulty in using them as appropriate symbols; for, if he were shown an object and asked to compose its name from a set of block letters, he was unable to do so. He counted up to ten, but could go no further and failed to solve simple problems in arithmetic. He succeeded in naming coins, although the words were badly pronounced, and in every case recognised their relative value. He showed a vivid appreciation of pictures and could draw on the whole correctly, even to command. He produced a ground-plan of his corner of the ward, but tended to draw some of the objects in elevation. Orientation was in no way affected. He played an excellent game of draughts.

Three years and nine months later, the defects of speech, though less severe, retained the same character, consisting mainly of loss of power to evoke words in a correct form and still greater difficulty in translating them into written symbols.

No. 19 (see p. 278) was a severe example of Verbal Aphasia due to an injury situated deep in the substance of the brain, unaccompanied by any external wound. The patient was unconscious for three weeks and recovered his senses to find that he was hemiplegic and was unable to say any word but "yes."

When he first came under my observation three years and nine months after the accident, the hemiplegia had passed away, except for some weakness and clumsiness of the right hand and to a less degree of the toes of the right foot. He was almost completely speechless and could not find words to designate familiar objects and colours. But he recognised their names; for he selected without fail a card bearing the appropriate designation of the object or colour shown to him. By this means he could name them correctly, although external verbalisation was almost impossible. He seemed to understand everything said to him and executed oral commands correctly. He showed remarkable power of comprehending printed words, provided he did not attempt to read them aloud or to spell out the letters of which they were composed, and he executed printed commands correctly. Writing was grossly affected and he could not write down unaided the names of objects or colours, the time shown on the clock, or movements made by me. But he succeeded better to dictation and copied correctly printed words in cursive script. He could not write the alphabet spontaneously and was unable to arrange the block letters in due order. Counting was defective and he failed to solve several simple problems in arithmetic; yet he could give the relative value of coins correctly. He drew to command and constructed from memory an excellent ground-plan of the room in which we worked. He played games well, provided he was not compelled to call the suit or number of the cards.

This case is an example of almost pure loss of verbalisation with no disturbance of the appreciation of verbal meaning. It shows that the power of forming words may be destroyed without loss of recognition of names. Were it not for the gross loss of capacity to write spontaneously and to carry out tests with the alphabet the case would correspond closely to one of "anarthria" as described by Marie.

No. 17 (see p. 248) was a case of Verbal Aphasia due to a severe gun-shot injury of the left hemisphere, followed by the formation of a cerebral abscess (Fig. 7, Vol. I, p. 445)

He showed gross spastic hemiplegia of the right arm and leg with some weakness of the same half of the face and tongue. This was associated with profound changes in sensibility. All the deep reflexes on the right half of the body were exaggerated, the abdominals were absent and the plantar gave an upward response. Vision was in no way affected.

He showed characteristic difficulty in finding words to express his thoughts and said that at first he had no more than a "twenty word vocabulary." Words were uttered singly or in short groups, isolated by pauses of varying length, and a single word of many syllables was liable to be slurred. Even a year after the injury, he could not say the alphabet perfectly and had much difficulty in counting. He named objects shown to him after considerable effort; this was due to defective power of verbal formation rather than to ignorance of nomenclature. He was able to repeat the content of what was said to him, but had the same difficulty in word-formation as during spontaneous speech. He seemed to understand what he heard and oral commands were executed with accuracy; he confessed, however, that, for a fortnight after he was wounded, he had difficulty in understanding things said to him unless they were "very simple and said very slow." He carried out printed commands correctly, but could not read to himself with complete understanding. When he read aloud, his articulation showed the faults evident during

voluntary speech, though to a less degree. He wrote slowly and with great effort, using the left hand. His spelling was preposterous considering his education and the form of the written words showed the same defects that were manifested by spontaneous speech. Similar errors were present when he wrote to dictation, but he copied the same passage from print without mistakes in cursive script. He counted slowly and with effort, yet he showed remarkable powers of arithmetic. He drew excellently with his left hand. Orientation was not affected and he constructed a perfect ground-plan of his room at the hospital. He played card games well and, even if he uttered a wrong number, was not misled, but brought out the total score correctly.

No. 4 (see p. 55) was a case of slight Verbal Aphasia due to a severe gun-shot injury of the skull with thrombosis of the superior longitudinal sinus and hernia cerebri.

There was profound right hemiplegia with grave loss of power in the left lower extremity. Sensibility, especially to passive movement, was grossly affected on the right side and to a slighter degree in the left leg. Both plantar reflexes gave an upward response. The left upper extremity was in every way normal.

He talked fluently, but had difficulty in forming the longer words, and could repeat anything said to him, provided the sentence was not long and complicated. He understood almost all that he heard and executed oral commands correctly. He could carry out printed orders without mistakes; but he complained that, when reading to himself, he had a tendency to miss some of the words and this want of verbal exactitude was liable to confuse him. He wrote with the left hand comparatively fluently, but his spelling was faulty and he tended to omit some of the words. To dictation his writing showed the same kind of faults. Printed matter was copied with complete accuracy in cursive handwriting. He solved simple problems in arithmetic correctly after some hesitation and, although he had been a bank clerk, found difficulty in adding up long columns of figures; yet he could give the exact relation of two coins to one another. He drew excellently. Orientation and plan drawing were perfect. He played all games with ease.

It is important to notice that No. 20 (see p. 295), who suffered from a severe and widespread disorder of symbolic formulation and expression consequent on the removal of an extra-cerebral tumour from the frontal and precentral region, passed through a stage of pure Verbal Aphasia on her road to recovery. Finally, the only abnormal signs were a slight difficulty in articulated speech and some want of facility in writing spontaneously (p. 318).

In the same way, No. 1, an extremely severe case due to an extensive gun-shot injury of the head, became on recovery a straightforward though grave example of Verbal Aphasia (p. 10). He then talked slowly and with obvious difficulty in finding the words he required, although he named objects correctly. He understood all that was said to him and executed even complex oral commands. He still failed to comprehend exactly what he read to himself, owing to defects of internal verbalisation. He wrote with difficulty both spontaneously and to dictation, but copied print perfectly in cursive script. He was unable to carry out tests with the alphabet and was puzzled by simple arithmetical problems. Orientation was in no way affected and he drew from memory an excellent ground-plan of his ward at the hospital.

(b) *Syntactical Aphasia.*

This variety of aphasia is characterised by a more or less gross disorder of rhythm and syntax. The patient talks rapidly, his speech is jargon, and prepositions, conjunctions and articles tend to be omitted; polysyllabic words are slurred or badly pronounced. These defects are apparent whenever the patient attempts to talk spontaneously, to repeat what is said to him, or to read aloud. Internal speech is also disturbed in a similar manner, though to a less degree. He can write the names of common objects and, in the less severe cases, can compose a short letter; but he is liable to fail in writing down the gist of something he has been told or has read to himself. He writes badly to dictation, but can copy printed matter perfectly in cursive script. Orientation is not affected. The extent to which the power of solving problems in arithmetic is disturbed depends on the standard of education reached by the patient, but he has no practical difficulty in dealing with money.

No. 15 (see p. 227) was a case of Syntactical Aphasia due to injury by a rifle bullet, which traversed the left temporal lobe from before backwards to make its exit behind the ear (Figs. 8 and 9, Vol. I, p. 449 and p. 451).

The left eye was destroyed, but the right showed loss of vision over the upper and outer quadrant of the field. There was no loss of motion or sensation. At first the movements of the right half of the face and tongue were a little weak, the right plantar reflex gave an upward response and the abdominals on this side were diminished; but these signs passed away within five months. He gradually developed attacks preceded by a "nasty smell" which nauseated him. Six years after he was wounded, this aura culminated for the first time in a seizure accompanied by loss of consciousness and characteristic chewing movements.

His speech was a perfect example of jargon due to disturbance of rhythm and defective syntax. He did not use wrong words, but he tended to talk with great rapidity and it was difficult to hear the prepositions, conjunctions or articles; these parts of speech were frequently omitted. The same errors marred his attempts to repeat what was said to him, or to read aloud; even when reading to himself he became confused by internal jargon and lost the significance of all but the simplest phrases. His power of naming was preserved, and he could state the time correctly. On the whole he understood what was said to him, unless he was compelled to repeat it to himself; simple oral commands were well executed, but he hesitated and made several errors over more complex tests. Spontaneous writing was poor, he wrote equally badly to dictation, but could copy perfectly. In the earlier stages, before the full development of the fits, he experienced little or no difficulty in counting and solved simple problems in arithmetic. He could name coins, knew their relative value and made no mistakes in the use of money. He evidently appreciated the full meaning of pictures, but found extreme difficulty in describing them in spoken or written words. He drew a spirit lamp both from the model and from memory, but failed to represent an elephant correctly. Orientation was unaffected and he drew a perfect ground-plan of a familiar room.

No. 13 (see p. 198) was a case of Syntactical Aphasia due to gun-shot injury of the left temporal lobe (Fig. 8, Vol. I, p. 449).

There was slight want of power and incoordination of the right hand associated with distinct loss of sensibility; this subsequently passed away entirely. The lower extremity was unaffected and the reflexes were normal.

He talked rapidly; the rhythm of speech was disturbed and syntax was defective, whether the words were spoken or read aloud. If hurried, he tended to lapse into jargon. He named objects correctly and could repeat all that was said to him. Comprehension of spoken words was unaffected and he could execute oral and printed commands; yet, if he said the phrases over to himself in order to remember them, he was liable to forget what he had been told or had read silently. He could write a good letter spontaneously, but made many mistakes when he attempted to put down what he had read or when he wrote to dictation. Numerals were badly pronounced and arithmetic was defective. He could express the simpler relations between two coins, but had difficulty if he was compelled to employ higher numbers. Orientation was not affected.

Four and a half years later his condition had improved, but the form assumed by the loss of speech was identical with that revealed by the earlier observations.

No. 14 (see p. 215) was a case of Syntactical Aphasia due to a gun-shot injury in the region of the first temporal gyrus and the Sylvian fissure (Fig. 8, Vol. I, p. 449).

He developed seizures in which he ceased to talk and his right arm fell powerless on the bed; he was never convulsed, did not appear to lose consciousness, but could not speak and was powerless to think. These attacks were preceded by a "tingling feeling" down the right side, accompanied by an hallucination of taste and smell and a peculiar mental state.

At first there was gross loss of power and incoordination of the right arm and leg; movements of the right half of the face were defective and the tongue deviated to this side. The deep reflexes on the right half of the body were brisker than those on the left, the right plantar gave an upward response and the abdominals on this side were diminished. Subsequent examination showed that there were profound changes in sensibility in the right upper and lower extremities.

From the first his speech was jargon. He knew what he wanted to say, but his words poured out in phrases which had no grammatical structure and were in most cases incomprehensible. He could not repeat a sentence said to him and, when he attempted to read aloud, uttered pure jargon. He was unable to find names for common objects and yet his correct choice to printed commands showed that he was familiar with their usual nomenclature. Comprehension of spoken words was obviously defective and he was liable to be puzzled by any but the simplest oral commands. In general conversation he frequently failed to understand what was said and to carry on a subject started by himself. Spontaneous thought was rapid and his intelligence of a high order, but his power of symbolic formulation and expression was hampered by defects of internal speech. He undoubtedly comprehended what he read to himself, even in French, but any attempt to reproduce it aloud resulted in jargon. Single words were for the most part more easily written than spoken and, when at a loss, he could frequently write something which conveyed his meaning. But he was unable to read what he had written, and this, together with his difficulty in forming phrases, made it impossible to compose a letter or coherent account of something he wished to convey. He could copy perfectly, but wrote badly to

dictation, because of the rapidity with which he forgot what had been said to him. He added and subtracted without difficulty and enjoyed solving financial problems. He could not name coins, although he recognised their relative value. He played the piano, read the notes correctly and evidently recognised the constitution of a chord and changes of key.

(c) *Nominal Aphasia.*

Nominal Aphasia is more particularly characterised by want of power to discover appropriate names, or to find categorical terms in which to express a situation. Except in the acutest stages, the patient possesses plenty of words, but he cannot apply them exactly and verbal form may suffer in his efforts to discover the correct name. Internal speech is gravely affected and there is usually difficulty in understanding and executing oral or printed commands. The patient cannot comprehend what he reads to himself. Spontaneous writing is grossly affected; to dictation he writes somewhat better, and he can usually copy printed matter in cursive script, interspersed with irrelevant capitals. The use of numbers is defective and arithmetical problems are solved with difficulty. He may be unable to state the relative value of two coins and cannot calculate the price of the article he has bought, although he remembers exactly what he paid. Orientation is not fundamentally disturbed, but he tends to be puzzled, when, after taking a wrong turning, he does not see the familiar landmarks he expected. He can recall the position of objects in some familiar room, yet he frequently fails to represent them accurately on a ground-plan and tends to draw them in elevation. Card games are impossible in the more severe stages, but the patient may be able to play draughts or even chess. He cannot read musical notation, although he can sing without words and recognise whether music is correctly played by others.

No. 7 (see p. 89) was a case of Nominal Aphasia, due to gun-shot injury within the limits of the left angular gyrus (Figs. 10 and 11, Vol. I, p. 456 and p. 457). There were no abnormal physical signs.

Six weeks after he was wounded he was so grossly aphasic that it was impossible to obtain from him any coherent information. He could not express himself either in speech or in writing and had obvious difficulty in discovering a method of formulating his meaning. He rapidly regained sufficient use of language to permit of more complete examination. He then failed to say his name and address, or the days of the week and the months correctly. He could not name familiar objects and colours and was unable to tell the time. Repetition was gravely affected, though the sounds he uttered usually bore some remote resemblance to the words said by me. He showed obvious defects in comprehending the significance of spoken words and phrases. Oral commands were badly executed; he chose common objects or colours after great hesitation, and frequently gave up the attempt altogether. He had considerable difficulty in understanding the meaning of single words put before him in print and selected familiar objects and colours slowly with obvious effort. He failed grossly to execute more complex printed commands. With great effort he succeeded in writing his name imperfectly, but could not add his address and failed

entirely to compose a letter. He was unable to write down the name of any of the colours shown to him and transcribed the time badly, although he employed numbers only. Writing to dictation was almost impossible, but he was able to copy correctly, using cursive script, interrupted by irrelevant capitals. He found it almost impossible to state the relative value of any two coins placed before him. Yet, in spite of his confused replies, he undoubtedly recognised their monetary value, for he was able to put together the equivalent of any one of them from amongst a heap of money on the table. Drawing to order was grossly affected and he failed to produce a ground-plan of the ward in which he lay, although he could indicate the position of the various objects visible from his bed. He played dominoes and draughts slowly but correctly. He sang in perfect time and tune, provided he did not attempt to pronounce the words.

Four years and nine months after he was wounded, his power to use all forms of language had greatly improved; yet although he could speak, read and write, he remained as definite an example of Nominal Aphasia as before. He managed to execute correctly all the serial tasks in which he had previously failed. But his powers of speech were obviously defective and he confessed that he had difficulty in finding names and that this confused him. Although he could carry out oral and printed commands, closer examination showed that any test, which demanded prompt recognition or formulation of differences in meaning between two or more words or phrases, was performed slowly and with effort. Above all he found difficulty in writing spontaneously, but he wrote well to dictation and copied excellently. He counted slowly but correctly and solved all but one of the simple arithmetical problems. He could name coins and state their relative value after some hesitation. He had recovered his power of drawing to command, but could not construct a ground-plan of the room in which we worked. Orientation was not affected. He could play draughts and billiards, but not card games.

No. 2 (see p. 14) was a case of Nominal Aphasia due to a fracture of the left half of the skull produced by the kick of a horse. The injury to the brain occupied mainly the region of the angular, superior parietal and parieto-occipital gyri (Figs. 10 and 11, Vol. I, p. 456 and p. 457).

Right hemianopsia of a gross character was present from the first; but there were no other abnormal physical signs.

The patient was a highly intelligent, young Staff Officer. Throughout the many years he has been under my observation, his speech has steadily improved; but the defects, though less in degree, remained identical in character. He had no lack of words, but suffered from want of capacity to find the one which exactly corresponded to the meaning he wished to express, or was an appropriate name for some definite object. At the same time he failed to understand the significance of words presented to him orally or in print. He read aloud badly, especially if he attempted to spell out the words letter by letter. Writing was gravely affected; at first he wrote with extreme difficulty spontaneously or to dictation and could not copy print correctly in cursive script. Though he drew well spontaneously or from a model, he was unable to produce the figure of an elephant to command and he could not construct a ground-plan of some familiar room. Orientation was not fundamentally disturbed, although he had difficulty in formulating even to himself the way from one place to another. He failed to solve simple arithmetical problems and had much difficulty in calculating change. He could play chess even in the earlier stages. Throughout he showed a remarkable power of reacquiring knowledge. For

example, he again mastered Hindustani, so far as to speak the language, and he recovered his power to play bridge. Superficially he would now pass for a normal, active man.

No. 11 (see p. 181) was a case of Nominal Aphasia due to a bullet wound in the left occipital region, running upwards and inwards, with a smaller opening in the skull situated in and just to the right of the middle line of the scalp (Fig. 24, p. 183).

Central vision alone was preserved in the right eye, whereas the left showed right hemianopsia with maintenance of central vision for 10° to the right of the fixation point.

There were no other abnormal physical signs. But the patient occasionally suffered from attacks in which, though consciousness was fully preserved, he either "felt numb" down the right side or seemed to go suddenly blind.

He talked slowly, but articulation and syntax were not essentially affected and he could repeat all that was said to him, if the sentences were not long and complex. He showed considerable hesitation in naming common objects and, at the first examination, failed several times with colours. He read to himself with difficulty and made many mistakes when reading aloud; in neither case could he obtain a clear notion of the meaning of the passage he had read. He wrote with great effort, employing capitals and small letters indiscriminately. Writing to dictation and even copying print into cursive script were very defective. He could count slowly up to a hundred, but hesitated over the higher decades. Numbers stated categorically seemed to convey little to him and he failed to place a certain coin into a definite bowl to orders given orally or in print. Moreover, his answers were equally defective, whether the command was printed in figures or in words, showing that it was the idea of number that was at fault. He failed to solve simple problems in arithmetic and had difficulty in stating the relative value of two coins, although he could build up the equivalent of any one of them from money placed before him. He was able to draw spontaneously, or from a model and from memory. But, asked to draw an elephant, he produced a figure without its most characteristic features; these he named and added one by one in response to my question as to what he had omitted. He could not construct a ground-plan, tending to represent all the salient objects in my room in elevation. In spite of the gross lesion of the visual centres, he still possessed visual imagery. There was no loss of orientation; he was liable to make mistakes, because he could not formulate to himself or to others the exact details of the route he should take. But he did not lose himself, for he recognised familiar landmarks, when they came into sight, and so guided himself to his ultimate destination correctly. He played draughts, but not card games, and was easily confused by puzzles.

No. 22 (see p. 329) was a case of Nominal Aphasia following a cerebral seizure in an elderly man with raised arterial tension and degenerated arteries. These defects of speech were associated with right hemianopsia, unaccompanied by any other signs of disease in the central nervous system.

Observations made eleven weeks and again three years after the attack, brought out results which were fundamentally identical in character. Words were not lacking, but he was perpetually held up for want of the one which exactly expressed his meaning. Articulation and syntax were not otherwise affected and he could repeat what was said to him, if it was not a long or complicated sentence. He had profound difficulty in naming an object shown to him. With colours he was particularly at fault; but, although he could not name them, he could describe how they would be composed from pigments. He under-

stood most of what was said to him and oral commands were performed slowly, though on the whole correctly. The execution of printed commands was grossly defective and he failed to appreciate the meaning of a printed passage read silently. This was even more evident when he uttered the words aloud. He had never been able to write easily and with freedom and, although he wrote his name and address accurately, he could not compose a short letter. He failed to write down the names of familiar objects and colours, but on several occasions wrote some word of associated meaning, or the names of the pigments he would employ to make the colour. It was not the act of writing which was at fault, but the power to discover words of the exact meaning to fit a certain situation and then to transform them into appropriate written symbols. He could copy print exactly, although he could not translate it into cursive script. He counted up to twenty, then became somewhat confused, but ultimately reached a hundred without a mistake. He failed to solve simple problems in arithmetic. Coins were named and their relative value stated correctly. He could draw from a model, but was profoundly puzzled when asked to draw an elephant, and failed to construct a ground-plan of the room in which we habitually worked. He could, however, indicate the position of each salient feature relative to himself. Orientation was not affected, but he was liable to become confused if he did not see before him the landmarks and guiding points he expected. He had lost the power of reading musical notation and could no longer play his double bass.

No. 23 (see p. 348) was a case of congenital disorder of speech in an otherwise intelligent young man. There were no abnormal physical signs.

He had never been able to learn to read or write with ease, and his defects of symbolic formulation and expression were akin to those in certain cases of Nominal Aphasia. He did not lack words, but insisted that he could not find those which aptly expressed his meaning. He named common objects correctly after some hesitation, but was slower and less accurate with colours. He understood what was said to him in ordinary conversation and could carry out oral commands. Printed orders were less readily executed and he failed to comprehend exactly what he read to himself silently. He was unable to write down the name of an object or colour shown him; nor could he reproduce in writing the contents of a printed paragraph he had read. His writing was equally defective, even when the words were dictated by me. He could, however, copy print in cursive script, showing that the fundamental fault lay in the power to translate speech into written symbols rather than in the mechanical act of writing. He failed to say or to write the alphabet spontaneously, to write it correctly to dictation, or even to put together the block letters in due sequence. He could count, but was unable to solve simple problems in arithmetic. Coins were named correctly and, with some effort, he was able to state their relative value. Orientation was unaffected, but he failed to draw an accurate ground-plan of the room in which we worked. He could sing, provided he did not attempt to find the words, and had a keen ear for faults in music played by others.

(d) *Semantic Aphasia.*

These defects are characterised by lack of recognition of the full significance of words and phrases apart from their immediate verbal meaning. The patient fails to comprehend the final aim or goal of an action initiated spontaneously or imposed upon him from without. He cannot formulate accurately, either to himself or to

others, a general conception of what he has been told, has read to himself, or has seen in a picture, although he is able to enumerate most of the details. Such patients understand what is said, can read and can write, but the result tends to be inaccurate and confused. Counting is possible and the relative value of coins may be recognised; but arithmetical operations are affected and the patient is commonly confused by the monetary transactions of daily life. Drawing, even from a model, is usually defective and in most instances construction of a simple ground-plan is impossible. Orientation is definitely disturbed. The patient finds considerable difficulty in laying the table, putting together portions of some object he has constructed, or in planning an operation he desires to perform. This interferes seriously with his activities in daily life and renders him useless for any but the simplest employment; and yet his memory and intelligence may remain on a comparatively high general level.

No. 10 (see p. 151) was a case of Semantic Aphasia, due to a wound with a hand-grenade in the region of the left supra-marginal gyrus (Figs. 12 and 13, Vol. I, p. 460 and p. 461).

There were no abnormal physical signs of any kind. But on two occasions, during periods of worry and mental distress, he suffered from a true epileptic attack, the first of which occurred five months after he was wounded, the second six years later.

He could name objects and colours shown to him and had no difficulty in finding or articulating words to express his ordinary needs; all his phrases were perfectly formed and spaced. But, in general conversation, he paused like a man confused, who had lost the thread of what he wanted to say. Words and sentences were repeated correctly, provided they did not contain a number of possible alternatives. He chose an object or colour named by me, but had obvious difficulty in setting the clock or in carrying out complex oral commands. He was easily puzzled and became confused with regard to the aim of the task set him. He understood the significance of printed words and short sentences, provided they did not contain a command. But he gave a poor account of a paragraph read silently to himself; his narration tailed away aimlessly, as if he had forgotten the goal for which he was making. He read aloud simple sentences without mistakes, but tended to doubt the accuracy of the words he had uttered correctly. He wrote with extreme rapidity, as if afraid of forgetting what he wanted to transfer to paper; at first, he tended to employ the same symbol for several different letters. He showed similar defects to dictation and not infrequently forgot what he had been told to write. Apart from the defects in handwriting he could copy correctly. Although he counted excellently, he was unable to carry out the simplest arithmetical operation; this was the more remarkable as he had been an accountant, accustomed to handle complex masses of figures. He was confused by the relative value of coins and had much difficulty with change in ordinary life. Although he appreciated the various details of a picture, he was liable to miss its general meaning. He could not draw from a model or from memory, nor delineate an elephant to command. He failed entirely to draw a ground-plan of a familiar room and was unable to express the relative position of its salient features. Orientation was gravely affected; he was liable to lose his way in the street and had difficulty in finding his own room in the hospital. He could play no games and puzzles worried him greatly.

Observations extending over seven years showed considerable variation in the degree but not in the character of the disturbance of function. In this case the sole disturbance produced by the lesion was want of capacity to comprehend and to retain in consciousness the general significance of some symbolic representation, or the intention of an act he was about to perform, either to command or on his own initiative. He could deal with the details of a situation, but not with its general aspects.

No. 8 (see p. 108) was a case of Semantic Aphasia in a young officer, who was struck in the left parieto-occipital region by a fragment of shell casing. The wound of entry, which lay over the supra-marginal gyrus and part of the superior parietal lobule, was alone accompanied by abnormal signs and symptoms (Figs. 12 and 13, Vol. I, p. 460 and p. 461).

Four months after he was wounded seizures appeared and recurred at varying intervals dependent on whether he was worried or not. They usually consisted of loss of consciousness with or without slight convulsions; each attack was preceded by a period of confusion and "loss of memory."

There was definite right hemianopsia which assumed a peculiar form occasionally found with lesions of the cortex. The loss of vision over the defective half of the field was not absolute and he could appreciate moving objects. Moreover, if with both eyes open two similar objects were exposed at exactly the same distance from the fixation point, that to the right was frequently not appreciated, although it might be recognised if shown alone.

Reflexes, motion and sensation were unaffected; but on admission the edges of the optic discs showed distinct traces of previous swelling.

The disorders of symbolic formulation and expression were of the Semantic type. He frequently failed to recognise the intention of what he was told to do and was unable to combine details, duly appreciated, into a coherent whole. This was associated with difficulty in grasping a general idea. Articulated speech was unaffected, and he named objects correctly. He chose them to oral and printed commands and had no difficulty in comprehending the meaning of single words or short phrases. Yet he could not set the hands of a clock and frequently failed to gather the full meaning of general conversation. Reading aloud was unaffected, but he gave an imperfect account of what he had read to himself. Writing as such was perfect, although he had difficulty in putting down on paper exactly what he had gathered from conversation or reading. He was unable to solve problems in arithmetic and became confused over money. Drawing was defective. He could not find his way alone or plan where he wanted to go. Games, such as billiards, were impossible.

He recovered to a great extent and, six years after he was wounded, could carry out all the serial tests without a mistake. But he still showed in a minor degree those disabilities which made him so characteristic an example of Semantic Aphasia.

No. 5 (see p. 64) was a case of Semantic Aphasia, due to a wound over the inferior and posterior portion of the right supra-marginal gyrus in a strongly left-handed man (Figs. 13 and 14, Vol. I, p. 461 and p. 463).

There was no disturbance of motion, sensation or reflexes. The visual fields were normal.

Articulated speech was not directly affected and he named common objects and colours correctly. The most striking feature was his inability to formulate, to appreciate and to retain in his mind the general meaning or exact intention of some act requiring

symbolic representation. He understood simple statements and chose common objects to oral commands; but he made gross mistakes, when attempting to set the hands of a clock, or to carry out the hand, eye and ear tests. He failed more particularly to reproduce the sense of a simple narrative communicated to him by word of mouth. When he read to himself silently, his difficulty lay not so much in understanding a word or phrase as in gathering the general meaning of a group of statements; but he ultimately succeeded in executing all the tests to printed commands. He wrote spontaneously with remarkable ease. Yet the names of common objects and the time shown on a clock were written down badly; his handwriting deteriorated and his spelling was defective. To dictation, he was inaccurate and even made mistakes in writing the phrases of the man, cat and dog tests. On the other hand, he could copy print excellently in cursive script. All these faults in reading and writing were particularly evident, when he was tested with a short account in printed characters of his life before the war. If he was asked to render the general meaning of a picture and its accompanying legend, he was liable to become confused and to invent some fantastic explanation. He failed to solve two out of the six problems in simple arithmetic and was frequently unable to express the relative value of two coins to one another. He failed completely to draw an elephant to order. Orientation was defective. He could not produce a ground-plan of a portion of the ward in the neighbourhood of his bed, although he could recall to mind the essential differences in the uniform of Sister and Nurse.

No. 18 (see p. 259) was a case of Semantic Aphasia, produced by a gun-shot injury in the region of the left superior parietal lobule, combined with sub-cortical destruction due to an abscess in the substance of the brain. A sinus led down to fragments of bone which were removed by operation (Figs. 12 and 13, Vol. I, p. 460 and p. 461).

My observations, made when he first came under my care in 1915, did not differ materially from those six and a half years later and they can therefore be summarised together. He suffered from no fits or seizures of any kind after the wound had finally healed. There was complete right hemianopsia and the pupils did not react to light thrown on to the blind half of the retina. There was no hemiplegia; face and tongue moved well on the two sides. Individual movements of the digits could be carried out perfectly with the eyes open; but, when they were closed, the fingers of the right hand performed finer movements clumsily. These digits were slightly atonic. The power of recognising posture and passive movement was diminished. The compass test, localisation, tactile sensibility and discrimination of shape, weight and texture were unaffected. All the reflexes, including the plantars and abdominals, were normal and equal on the two sides.

The defects of symbolic formulation and expression consisted in want of ability to recognise fully, to retain firmly and to act logically in accordance with the general meaning of a situation. Details could be appreciated correctly, but were not uniformly coordinated with certainty to form a total impression. No abnormality could be noticed in the course of ordinary conversation, beyond a certain hesitancy and diffidence in expression; there was a tendency for his talk to die out before it reached its full logical conclusion. He named correctly and repeated everything he heard with ease. He understood what was said to him and could carry out simple orders, although more difficult oral commands confused and puzzled him. He could read silently or aloud and understood the meaning of what he read, if it was not complex. He wrote his name and address correctly; yet, when he attempted to write down the gist of what he had been told or read to himself, he was liable

to make curious errors. The act of writing was extremely rapid, as if he was afraid of forgetting what he wanted to express, and, even to dictation, he was liable to omit important words. He found difficulty in writing the alphabet, although he could say it correctly. Simple arithmetical exercises were badly performed and he started in each instance from left to right; it was not the detailed significance of numbers that was at fault, but the general conception of the acts of addition and subtraction. Once this had been rectified in his mind, the same problems were easily solved. In spite of the fact that he named coins and stated their relative value correctly, he was greatly puzzled by monetary transactions in daily life. Orientation was not so grossly affected as in some other patients of this group, but he did not like to go out unattended. The plan he drew of the room in which we worked was defective, although he could indicate orally its salient features. He understood straightforward pictures; those which demanded composition of detail, or the simultaneous comprehension of a printed legend, usually failed to convey to him their full meaning. He had the greatest difficulty in formulating the general intention of some act he was about to perform spontaneously or to order; but he was able to copy simple actions with ease, provided they did not demand recognition of several alternatives. Oral, pictorial and printed commands suffered to an almost equal extent. He could not put together the parts of a piece of furniture he had made under guidance and was unable even to lay the table with certainty. He could play no games with pleasure, and disliked puzzles, which confused him.

No. 24 (see p. 370) was a case of Semantic Aphasia, due to a vascular lesion in an elderly man. There were no abnormal signs beyond the affection of speech.

His principal defects of symbolic formulation and expression consisted in want of capacity to appreciate the general significance of details, however presented, and inability to deduce from them their logical consequences. He also failed to recognise, or was unable to retain in his mind, the full intention of an act he was about to perform spontaneously or to order. Thus, he frequently misunderstood the ultimate significance of pictures, especially in conjunction with a printed legend. During any series of tests he repeatedly forgot what he was expected to do and reflection of my movements in a mirror confused, rather than aided, him in imitating them correctly.

He talked rapidly, in somewhat slow and jerky sentences, as if afraid of forgetting what he wanted to say. He named objects slowly but correctly and did not lack words, although in ordinary conversation he occasionally used a wrong expression. He could repeat anything said to him, provided it did not consist of a long and complicated sentence. Single words and short phrases were perfectly understood and he executed even complex oral commands. If, however, he developed a false general conception of what he had heard, he was unable to correct it and became confused. Although he could carry out printed commands, he had great difficulty in understanding what he read to himself or aloud. Given a series of sentences which led by consecutive steps to some general impression, he was unable to reproduce what he had read. He wrote his name and address perfectly, but could not place on paper without the grossest mistakes his own ideas or the gist of something he had heard or read. To dictation he wrote well, except that he was confused by his errors in spelling. He copied slowly but perfectly. He counted with accuracy and wrote the numbers without difficulty; arithmetical problems puzzled him and were solved with effort. Coins were named correctly, but he expressed their relation to one another clumsily and was confused by the monetary transactions of daily life.

Drawing was very defective, even with a model before him. Orientation was gravely disturbed and he failed entirely to construct a ground-plan of the room in which we habitually worked.

No. 25 (see p. 379) was a case where the Semantic defects were of congenital origin. They were associated with no abnormal physical signs of any kind. From childhood the patient had recognised that she was unlike other persons. She had extreme difficulty in learning to read, to write and to carry out even simple calculations. But in spite of her disabilities, she was unusually intelligent and originated the idea of open-air schools, which she actually carried into execution. Her introspective notes formed a valuable addition to the results of my examination.

She could find all the words and names she required, even for the serial tests, and the syntax and balance of her phrases was unaltered. Repetition of words and short sentences was not affected. At first sight she seemed to understand everything said to her and she chose common objects and colours correctly and even executed the hand, eye and ear tests slowly to oral commands. But she complained that she could not "hold in her mind" a task explained to her in the course of conversation. Printed commands were on the whole well executed, but she was liable to miss the general significance of a passage read silently. Uttering the words aloud seemed to aid her greatly. The character of her hand-writing and her power of expressing herself in this medium depended on the ease or difficulty of the task. When she wrote spontaneously, or attempted to reproduce what she had heard or read to herself, she was liable to omit essential points and her spelling was grossly defective; yet she copied printed matter in excellent cursive script. She had difficulty in solving simple problems in arithmetic and was confused with regard to the relation of two coins to one another. Orientation was distinctly affected and she had difficulty in finding her way.

§ 3. CASES ILLUSTRATING CEREBRAL LOCALISATION

(a) *Gun-shot and local injuries of the skull.*

In No. 6 (see p. 76) the wound was an almost vertical cut in the left temporal region of the scalp, 5 cm. in length, penetrating all the tissues, including the bone. In its deepest part the dura mater was laid bare, but the brain substance was not exposed. There was no wide-spread fracture of the skull and healing was complete in thirty days. No operation was performed at any time.

The upper end of this linear incision was 5·5 cm. from the middle of the scalp and 14 cm. behind the root of the nose; it lay 0·5 cm. anterior to the interaural line, whilst its extreme lowest point was 3 cm. in front. The whole nasion-inion measurement was 34·5 cm. and this was intersected at 14·5 cm. by the interaural line.

When the wound was plotted on the brain of a skull with approximately the same measurements, it was found to lie on the anterior portion of the precentral gyrus, extending downwards on to the inferior frontal convolution (Fig. 7, Vol. I, p. 445).

There were no abnormal physical signs, except a transitory weakness of the right half of the lower portion of the face and some deviation of the tongue to the right. All the reflexes, including the abdominals and plantars, were normal.

This patient was an excellent example of Verbal Aphasia.

No. 17 (see p. 248) was much less satisfactory from the point of view of anatomical localisation; for the extraction of a bullet from the brain was followed by formation of an abscess, which undoubtedly caused a considerable amount of deep destruction.

About ten days after he was wounded he was trephined and a rifle bullet was removed from the "left Rolandic region." When he came under my care five months later, the wound was represented by a sinus from which issued a considerable quantity of pus. The opening was situated 16 cm. backwards along the nasion-inion line, in the centre of an irregular area, from which bone had been removed; this measured 4·5 cm. vertically and 6 cm. horizontally and extended between two points 13 cm. to 19 cm. posterior to the root of the nose. The upper border of the bony opening lay 6 cm. from the middle line of the scalp. After removal of some fragments of bone from the substance of the brain and efficient drainage of an abscess cavity, the wound finally healed within eight months from the injury.

When the extent of this bony opening, which corresponded to those parts denuded of dura mater, was plotted on the surface of the brain, it was found to occupy an area extending between the inferior precentral and the lower third of the postcentral fissures. The destruction of tissue was not only superficial, but extended deeply into sub-cortical portions of the brain (Fig. 7, Vol. I, p. 445).

For a time he suffered with Jacksonian convulsions, which began in the right hand and were always accompanied by some loss of verbal capacity. He showed the characteristic signs of a spastic hemiplegia; isolated movements of the right hand were impossible and the whole limb was hypertonic. The right leg was in a state of extensor rigidity accompanied by loss of power of dorsiflexion at the ankle. The lower portion of the right half of the face was somewhat affected and the tongue was protruded to this side of the middle line. Gross sensory changes of the cerebral type were present in both arm and leg of the affected half of the body. All the deep reflexes were greatly exaggerated on the hemiplegic side, the plantar gave an upward response and the abdominals were absent. The visual fields were unaffected.

His defects of speech formed a characteristic example of Verbal Aphasia.

In No. 15 (see p. 227) a rifle bullet had entered just to the left of the inner canthus of the right eye and had made its exit directly above the insertion of the left ear. A month later the wound of entry was represented by a minute perfectly healed white scar. On the other hand, the exit consisted of an irregular opening in the bone and tissues of the scalp, through which protruded a small pulsating hernia cerebri. Bone had been removed over an irregularly quadrilateral area about 3 cm. in vertical and horizontal extent; below, the opening reached the level of the insertion of the ear, and above, it was about 13 cm. from the middle line of the scalp, corresponding anteriorly to a point on the nasion-inion line 13 cm. from the root of the nose. The total distance from the nasion to the external occipital protuberance was 35 cm. The wound healed completely in eighteen weeks.

Thus the track of the bullet passed back through the left temporal lobe, entering its substance close to the tip and passing out at the level of the insertion of the left ear (Fig. 9, Vol. I, p. 451). When plotted on the surface of the brain, the exit wound lay over the middle of the second temporal convolution, but must have produced some destruction both above and below the superior temporal fissure (Fig. 8, Vol. I, p. 449). In its course it injured the extreme lower fibres of the optic radiations, producing upper quadrantic hemianopsia in the sole remaining eye.

A fortnight after he was wounded, there was a little weakness of the lower portion of the right half of the face and the tongue deviated slightly to the right. There was no loss of motion or sensation. The right plantar reflex gave an upward response and that from the right half of the abdomen was diminished. All these abnormal signs passed away entirely within five months from the date of the wound, leaving only the upper quadrantic hemianopsia, as far as such a condition could be observed in the one remaining eye. Ultimately he developed epileptiform attacks, preceded by an aura of smell and taste characteristic of a lesion within the temporal lobe.

His speech was jargon and the defects in the use of language assumed the form of Syntactical Aphasia.

No. 13 (see p. 198) would have been equally valuable from the point of view of localisation, had it not been for the uncertainty introduced by the operation carried out at the Front. He was struck by a shell fragment in the left temporal region and, when he came under my care some three weeks later, there was a linear surgical scar extending from the fronto-temporal to the parietal aspect of the scalp. On this healed incision was a pouting sinus, which lay 8 to 9 cm. from the middle of the scalp and was level with a point 16 cm. along the nasion-inion line. Here bone had been removed over an irregular area; when plotted on the surface of the brain it was found to lie just behind the central fissure.

But exactly below this area, 11 cm. to the left of the middle line, lay another fungating sinus penetrating the bone. This orifice in the skull was at a distance from the surgical incision and had not been subjected to operative treatment of any kind. It undoubtedly represented one of the original wounds and, when plotted on the surface of the brain, lay over the upper portion of the first temporal gyrus and the Sylvian fissure, on a level vertically with the foot of the postcentral fissure (Fig. 8, Vol. 1, p. 449). I should like to suggest that this was the lesion responsible for the specific form of the loss of speech. The patient on receipt of the wound was obviously aphasic and the missile had probably injured the skull in the neighbourhood of the Rolandic region. The surgeon therefore trephined over the central fissure, but paid no attention to the small wound at a lower level over the temporal lobe, which had also perforated the skull.

He had no fits and showed very few abnormal physical signs of injury to the brain. At first the movements of the right angle of the mouth were slightly less than those of the other side and the tongue was protruded a little to the right; but this passed away quickly. The right hand "felt different"; the grasp was comparatively feeble, the fingers were somewhat hypotonic, but individual movements were possible. There was distinct ataxy of the fingers with the eyes closed, and the power of recognising passive movement and posture was defective in the right hand. All other forms of sensibility were perfect. The lower extremity was unaffected. All the reflexes were normal, including plantars and abdominals. These abnormalities of the right hand during the earlier stages are accounted for by the wound over the postcentral convolution.

On the contrary, the typical Syntactical defects of speech were probably due to the coincident injury of the first temporal convolution.

No. 14 (see p. 215) suffered from a much more severe injury, lying, however, exactly in the same situation as that of the effective wound in No. 13.

He was hit by a fragment of shell casing or by shrapnel just above the insertion of the left ear. When I saw him six weeks later, the wound was represented by a

granulating surface of 2 cm. by 1·5 cm. situated 11 cm. from the middle of the scalp and 16 cm. backwards along the nasion-inion line. This unhealed patch was surrounded on three sides by a horse-shoe shaped incision, which had united firmly. Within, lay an irregularly quadrilateral area, where the bone had been removed; this was covered by normal scalp except over the site of the original wound.

When this was plotted on the surface of the brain, it was found to lie over the first temporal gyrus and the Sylvian fissure (Fig. 8 Vol. I, p. 449). But the trephined area was more extensive, especially in front and above, and there can be no doubt that it extended forwards to the lower portion of the central fissure.

The characteristic defects of speech were associated with extensive signs of cerebral injury. He developed seizures in which he ceased to talk and the right arm fell powerless on to the bed. He was never convulsed and did not always appear to become unconscious in these attacks, but he was unable to speak and found he was powerless to think. These attacks were preceded by a "tingling" feeling down the right arm and leg, accompanied by an aura of taste and smell and a peculiar state of mind, which he could not describe in comprehensible terms.

He did not suffer from headache or vomiting. The optic discs were normal and there was no hemianopsia. Movements of the lower part of the right half of the face were defective and the tongue deviated to this side. The deep reflexes on the right half of the body were brisker than those on the left and the right plantar gave an upward response; the superficial reflexes from this half of the abdomen were greatly diminished compared with those from the left. Even in the early stages there was no absolute paralysis of the right upper or lower extremity; isolated movements of the fingers were possible, but there was extreme incoordination of both arm and leg. Subsequent examination showed that the loss of power was mainly afferent in origin.

He was a severe instance of Syntactical Aphasia. His speech, both external and internal, was jargon and he could not write coherently.

No. 7 (see p. 89) was wounded by a fragment of a high-explosive shell, which produced a compound depressed fracture of the skull in the left parietal region, with laceration of the dura mater and protrusion of brain substance. He came under my care, nearly six weeks later, with a granulating stellate wound; in front this lay 7 cm., behind 9 cm., from the middle of the scalp and it extended between two points 19·5 cm. and 27 cm. on the nasion-inion line. An X-ray photograph showed an area of removal of bone in the anterior parietal region measuring 4 cm. by 2 cm. at its broadest part, with a fissured fracture running directly forwards. This wound healed finally eight weeks after it was inflicted.

When the extent of this opening in the bone was plotted on the surface of the brain, it was found to occupy an area shaped like an arrow head, pointing upwards and forwards within the limits of the angular gyrus (Figs. 10 and 11, Vol. I, p. 456 and p. 457).

There were no abnormal physical signs pointing to gross injury of the brain. The visual fields were normal; motion, sensation and the reflexes were unaffected.

His defects of speech formed a superb example of Nominal Aphasia.

No. 2 (see p. 14) was of much less value for purposes of anatomical localisation. The lesion was extensive and deep, at any rate in the centre; but the clinical observations were of unusual completeness and interest.

This young Staff Officer received a compound fracture of the skull in the left parieto-occipital region from the kick of a horse. Fragments of depressed bone were removed by operation, carried out within a few hours of the accident, and the brain below the injury was found to be reduced to pulp for a depth of about 7 cm.

At a subsequent operation to repair the opening in the skull, we were able to determine its exact limits. Its largest diameter, pointing upwards and a little forwards, was 10 cm., whilst horizontally it measured 5·5 cm. at its broadest part. Looked at from behind, its superior border was opposite a point 23 cm. along the nasion-inion and 3·5 cm. to the left of the middle of the scalp; below, it reached a point 33 cm. on the nasion-inion line and 3·5 cm. to the left.

Plotted on the surface of the brain this area of loss of bone occupied the angular, superior parietal and parieto-occipital gyri; its anterior border extended as far forward as the middle of the supra-marginal (Figs. 10 and 11, Vol. 1, p. 456 and p. 457). But we must bear in mind that this gives the extreme limits of the injury within which the destruction of brain tissue occupied a smaller extent.

Right hemianopsia was present from the first, but motion, sensation and the reflexes were unaffected.

He was a superb example of Nominal Aphasia.

No. 10 (see p. 151) was wounded in the left parietal region by the premature explosion of a hand-grenade. At the operation next day the dura mater was found to have been perforated in two places and two small fragments of bone were removed from the brain.

When he came under my care, thirty-four days later, the wound had healed completely. Bone had been removed over an oval area 2·5 cm. by 1·25 cm., extending between two points 15·5 cm. and 18 cm. along the nasion-inion line at a distance of 8 cm. from the middle of the scalp.

On plotting the site of this lesion, it was found to occupy the anterior portion of the supra-marginal gyrus, bounded in front by the postcentral fissure (Figs. 12 and 13, Vol. 1, p. 460 and p. 461). It was of small size and did not extend deeply into the substance of the brain; this was confirmed at an exploratory operation carried out whilst he was under my care.

There were no abnormal physical signs of any kind. But on two occasions in seven years, during periods of worry and mental stress, he suffered from an epileptiform seizure.

His defective use of language formed an excellent example of Semantic Aphasia.

No. 5 (see p. 64) was the only left-handed man in my series, and the wound, due to a rifle bullet, was situated in the right parietal region. On admission to the Base Hospital, this was a minute punctured opening, from which exuded cerebro-spinal fluid mingled with small quantities of disintegrated brain matter. The bullet had bored a circular hole in the skull, perforated the dura mater and was extracted from a point in the brain about 4 to 5 cm. in depth.

A fortnight later, when he came under my care, the wound of entry was healed and covered by a minute scab; it was situated 20·5 cm. backwards along the nasion-inion line and 11 cm. from the middle of the scalp.

This opening in the skull was found to lie over the inferior and posterior portion of the supra-marginal gyrus (Figs. 14 and 13, Vol. 1, p. 463 and p. 461).

There were no abnormal physical signs and the field of vision was not affected.

This patient also was an excellent instance of Semantic Aphasia.

In No. 8 (see p. 108) the lesion was more severe and of considerably greater extent. He was struck in the left parietal region by a fragment of shell casing, which traversed the brain almost directly from side to side and was removed through a small trephine opening over the right supra-marginal region.

When he first came under my care a month later, there was a small pouting wound of entry on the left side, which lay in the centre of a trephined area measuring 4 cm. by 2·75 cm. It extended between two points 26 cm. to 29 cm. along the nasion-inion; above, it was 2·5 cm., and below, 8 cm. from the middle line of the scalp, seen from behind. This healed in a fortnight. The opening on the right side, from which the missile had been removed by operation, had healed completely on admission.

When the extent of the opening in the skull surrounding the wound of entry was plotted on the surface of the brain, it was found to occupy the supra-marginal gyrus and part of the superior parietal lobule (Figs. 12 and 13, Vol. I, p. 460 and p. 461).

Four months after he was wounded, he developed epileptiform attacks in which he became unconscious and was slightly convulsed. Under the influence of worry, confusion and noise these became somewhat frequent; but, with treatment and a quiet life in the country, they have been greatly reduced in number.

The most striking physical abnormality consisted of a peculiar form of defective vision characteristic of certain cortical lesions. Over the right half of the field a moving object could be appreciated up to the periphery, but a stationary white square was frequently unrecognised. Moreover, if two discs were exposed simultaneously, one to the left and the other to the right of the visual field, he never failed to appreciate the former, though he was frequently uncertain to the right of the middle line. This condition has remained unchanged throughout.

On admission, the optic discs were blurred at the edges, showing traces of previous swelling which had subsided. The pupils reacted well, even when the light was thrown on to the affected half of the visual field. Motion, sensation and the reflexes were unaffected. There were no abnormal signs on the left half of the body referable to the trephine opening on the right side of the skull through which the missile had been extracted.

His defects of speech formed an excellent example of Semantic Aphasia.

In No. 18 (see p. 259) the lesion lay somewhat higher and there was definite evidence of considerable sub-cortical destruction. He was struck by shrapnel and, when admitted under my care a month later, the wound consisted of a long granulating area which, at the site of its maximum breadth, covered a small stellate fracture of the skull. In the centre of this portion a small sinus led into the substance of the brain. This closed prematurely and suppuration continued in deeper parts. Finally, we explored the track, and several fragments of bone, lying about 1·5 cm. from the surface, were removed. The wound then became reduced to a minute sinus extending for 8 cm. downwards, forwards and inwards; this healed completely seven weeks after the operation and exactly eight months from the date of injury.

The opening in the skull occupied a roughly quadrilateral area, measuring 2 cm. in either direction. The superior border lay 1·5 cm. from the middle of the scalp and corresponded to two points 22·5 cm. and 24·5 cm. on the nasion-inion line. Plotted on the surface of the brain this area was found to lie over the superior parietal lobule (Figs. 12 and 13, Vol. I, p. 460 and p. 461). But, when interpreting the signs and symptoms, we must not forget the definite evidence of sub-cortical destruction of tissue.

He suffered from no fits after the wound had finally healed. There was complete right hemianopsia and the pupils did not react to light impinging on the blind half of the field. Face and tongue moved equally on the two sides. Individual movements of the digits could be carried out perfectly with the eyes open; but, when they were closed, the fingers of the right hand performed these finer movements less perfectly than the left. Moreover, the right hand was slightly atonic. These defects were obviously afferent in origin and the power of recognising posture and passive movement was found to be somewhat diminished. Other forms of sensibility were unaffected. The reflexes were normal and equal on the two sides.

The defects in the use of language conformed to the Semantic type, but were somewhat less profound than in the previous cases. On the other hand, there was gross hemianopsia and some loss of sensibility in the right upper extremity.

(b) *Removal of an extra-cerebral tumour.*

No. 20 (see p. 295) was a woman of 56 in whom profound and extensive aphasic manifestations followed removal of a tumour which pressed upon the brain. Before the operation she suffered from occasional seizures which began in the thumb and index finger and, on the last occasion, the attack was followed by loss of speech lasting for several hours.

When she first came under my care in May, 1922, there were no abnormal physical signs of any kind except that I could not obtain the reflexes from the right half of the abdomen. Both plantars gave a downward response.

On June 20th, 1922, Mr Wilfred Trotter removed a smooth, lobulated, fibrous growth, which measured 5 cm. antero-posteriorly, 4 cm. vertically and 3·5 cm. in depth. Microscopically its structure was that of a fibro-endothelioma. It sprang from the dura mater, which was in turn firmly attached to the bone above it; this was soft and vascular, cutting like cheese. The tumour was so carefully extracted that not even the smallest fragment of cortical tissue adhered to the mass removed. The depression it had produced in the substance of the brain seemed to be centred around the meeting point of the inferior frontal and inferior precentral fissures.

The wound healed by first intention and the patient showed no evidence of surgical shock. The operation was, however, followed by profound aphasia accompanied by complete flaccid hemiplegia on the right side of the body with paralysis of the same half of the tongue and lower half of the face. The right plantar reflex gave a definite upward response, and arm- and knee-jerks were brisker than those on the normal side.

She improved steadily day by day both physically and in her powers of speech. At the expiration of sixteen days all abnormal physical signs had disappeared. Within four months after the operation she had been transformed from a profound example of aphasia into one so slight that it might have been mistaken for an articulatory disturbance only.

A little more than ten months after the operation, as the result of worry and consequent insomnia, she regressed to a condition resembling that found four weeks after removal of the tumour. Speech, reading and writing had grossly deteriorated and many of the serial tests were badly executed. There were no abnormal physical signs. The causes of her worry were removed and five months later she had recovered to a degree never reached before. This improvement continued, and has been steadily maintained.