in patients who respond well to drug treatment and in the absence of symptoms of increased intracranial tension. On the other hand, a sample of the cerebrospinal fluid should be obtained from every patient whose cerebral symptoms fail to clear up within two or three days after the beginning of treatment and in all cases in which these symptoms set in during the course of treatment or recur after a transient improvement.

It is unlikely that any constant relation exists between the concentration of sulphapyridine in the blood or cerebrospinal fluid and the appearance of this type of toxic reaction. Although the amount of sulphapyridine given in the first four cases is much higher than the dose which would be used to-day, a number of patients have taken similar large doses without ill effect. On the other hand, the dosage in Case V would not seem to be excessively high, and yet the patient developed toxic manifestations. It is probable that individual sensitivity to the drug plays an important part in the causation of these toxic symptoms.

Conclusion

The number of cases treated at this hospital during the past fifteen months is too small to allow us to draw any definite conclusions as to the incidence of cerebral symptoms attributable to sulphapyridine treatment. It seems, however, that they are not at all uncommon. It is safe to say that the incidence of this type of toxic reaction is greater among children than among adults, and those receiving the drug by the parenteral route are more liable to it than are those taking it by mouth.

Summary

Five cases of meningococcal meningitis showing persistent cerebral symptoms are reported.

It is suggested that these symptoms were due to the toxic effect of sulphapyridine.

We have to thank Dr. T. Peirson, medical officer of health to the city of Plymouth, for permission to publish the case notes.

LOSS OF VISION FOLLOWING HAEMORRHAGE

BY

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Loss of vision following haemorrhage attracted considerable attention in the earlier decades of the nineteenth century, when blood-letting provided a cause which fortunately no longer operates. It is a rare complication, and surprisingly so after haemorrhage due to accident or trauma, such as occurs in warfare.

The mode of development of the disturbance of vision falls into two groups. In the first group the disturbance closely or immediately follows the haemorrhage. Thus on recovering from syncope due to loss of blood the individual finds that the vision is entirely lost or is impaired in varying degrees. With the more severe grades, especially complete blindness, there is often considerable emotional disturbance, and for this reason the condition has been held to be functional. But more probably it is due to sudden anaemia of the cortical visual centres or of the retina, analogous, as Rolleston points out, to the impairment of hearing which may occur. There are no changes in the fundus. The disturbance is transient, recovery beginning immediately and being as a rule complete and permanent. This group is not further referred to.

The second group is more important, but is undoubtedly rare. In this type there is usually an interval after the

haemorrhage before vision is affected. The impairment may then advance for several days before recovery begins, and some degree is often permanent. Oedema of the disk is nearly always recognizable, though the swelling may be only slight, and oedema of the retina has been described in recent cases. Optic atrophy develops in permanent cases.

The Literature

Harbridge (1924) could find only 18 cases recorded in the literature between 1912 and 1924, a period which included the last war. There has been much discussion as to what is the cause or lesion; it is generally agreed that a combination of several factors is necessary, and possibly these are not identical in all cases. It is probable that blindness never follows haemorrhage in an individual who is in normal health. Haemorrhage alone is not a sufficient factor, since permanent or prolonged disturbance of vision does not follow a single haemorrhage, however profuse, and there is no recorded instance of permanent loss of vision in the bleeding of haemophilia.

Anaemia likewise is not a sufficient cause by itself. In the Victorian and pre-war era two great anaemic diseases were prevalent—pernicious anaemia and chlorosis. For the purposes of a discussion on the ophthalmological complications of diseases of the blood, Panton (1935) investigated a series of 117 consecutive cases of pernicious anaemia admitted to the London Hospital between 1911 and 1920. In this series there were only two cases in which there was disturbance of vision. In one case the patient complained of dimness of vision, and the ophthalmic surgeon's note reads, "Oedema of both disks and retinæ: about 2D of swelling in right disk, less in left disk. Many linear haemorrhages in fundi." In the other case the patient complained of rapid loss of vision, ending in almost complete blindness associated with complete optic atrophy. She had, in addition, fairly advanced cord changes. This is the only case recorded in the literature of severe loss of vision occurring in pernicious anaemia. In chlorosis it may be accepted that papilloedema is occasionally found, and there are many discussions in the older literature as to its significance. Nevertheless it is clearly not of a high degree, and is usually recorded as blurring or haziness of the edge of the disk. It is noteworthy that Clifford Allbutt (Allbutt and Rolleston, 1909), who must have had an enormous experience, stated that he had never seen a case of permanent blindness developing in chlorosis. Before the days of modern treatment the oozing from haemorrhoids sometimes reduced the subject to a state of extreme anaemia, and a profuse haemorrhage might then occur. Nevertheless there is no instance in the literature of disturbance of vision in this condition.

There is little evidence on which to assess the influence of oedema. Certainly gross oedema, apart from a nephritic origin, has no part in producing permanent loss of vision, but most of the recent ophthalmological examinations, when made shortly after the onset, record oedema of the retina and some swelling of the disk, though the latter may be slight. Such localized oedema might well occur after a severe haemorrhage or after a more moderate haemorrhage in an otherwise debilitated subject. It is not impossible that shock may be an important factor.

Site and Circumstances of Haemorrhage

The site of the haemorrhage is of interest. Fries (quoted by Barr, 1934) gives the statistics of 106 cases recorded up to 1876 as follows: Gastric ulcer, 36%; uterus, 25%; epistaxis, 7%; blood-letting, 25%; accidental wounds, 5%. In those days the condition especially attracted attention as a sequel of blood-letting, and Gowers refers to this at some length in his *Medical Ophthalmology*. He states that loss of vision occurred only after repeated bleedings

and never after a single blood-letting, however large; and he points out that the subjects were all in bad health previously. He expresses the opinion that a single haemorrhage, however profuse, never results in permanent loss of vision in an otherwise healthy subject. This is borne out by the extraordinary rarity of this sequel in accidental haemorrhage. There appear to be only three cases recorded in the last war—two by Pincus (1918) and one by Terrien (1921)—and there is a striking similarity in the histories. In all three cases a lower extremity was crushed, gas gangrene supervened, and amputation was performed several days after the wound. It is now known that serious metabolic disturbances develop in such circumstances. No doubt there are other unpublished cases.

Harbridge gives the site of bleeding in the 18 cases published between 1912 and 1924 as follows: peptic ulcer, 6; uterus, 6; nose, 3; and 3 of accidental haemorrhage, these last being the cases of Pincus and Terrien. The comparative frequency of epistaxis is interesting. Harbridge records a personal case in which epistaxis had been recurrent and severe since childhood, and the history suggests a blood-deficiency disease, such as thrombocytopenia and hypoproteinaemia.

The circumstances of the haemorrhage vary considerably. Most commonly there is a history of repeated haemorrhage, the bleeding which preceded the disturbance of vision usually but not always being severe. In other cases there has been prolonged haemorrhage—for example, after childbirth. Rarely there has been only a single haemorrhage, but the subject has been in a debilitated or toxic state. In Harbridge's case associated with epistaxis, impairment of vision has occurred on three occasions separated by several years. No age is immune: most of the subjects have been between 40 and 50, but cases are recorded in childhood and in old age. There is little difference in its incidence in the two sexes. A striking feature is the interval which commonly elapses between the haemorrhage and the recognition by the patient that the vision is impaired. The initial complaint is usually made between the third and eighth days. The longest recorded intervals are eighteen and twenty days. The impairment, however, may be recognized shortly after the haemorrhage, as on recovery from syncope; and it is said that this was comparatively common in blood-letting cases but, as Gowers states, not after a single bleeding. It is possible that in these instances the initial blindness belongs to the first group, and the more permanent type follows. The diminution of vision when first noticed may vary from blurring to complete blindness. In the partial grades it tends to increase for three or four days, and then improvement may set in. Recovery may be rapid at first and then continue slowly for weeks or months. Several observers agree that the upper part of the field of vision is less affected and recovers more completely than the lower part. If the loss of vision becomes complete it usually remains so permanently, but Lister (1929) mentions a case in which recovery was perfect three months later. The disturbance of vision is generally bilateral: but it may be unilateral, or the degree of impairment may be different in the two eyes.

As to the final result, in 33% of the cases blindness is complete and permanent in both eyes, and in 50% there is no improvement from the maximum loss. About 10% recover good or complete vision. In the remainder there are varying degrees of improvement in one or both eyes.

Findings in the Visual Field

Visual field findings show great variations. In Bamford and Barber's (1940) case there was progressive concentric contraction of the fields. In Barr's case there were central

scotomata with enlargement of the blind spots and only slight contraction of the colour fields. There may be sector-like defects or paracentral scotomata. Ophthalmological changes are also inconstant. When examined shortly after the onset most observers record swelling of the optic disk, which may be intense or as little as one dioptre, or only blurring of the margins. In Lister's case, referred to above, with complete blindness there were no fundus changes. In several cases oedema of the retina has been recorded. Goerlitz (1920) was able to make a pathological examination of the eyes from a man who died ten days after the onset of blindness following haematemesis. The principal changes were intense oedema of the disks and oedema of the retinae. Goerlitz states that the changes resemble those found in intoxication amblyopia such as is caused by methyl alcohol.

In cases of definite permanent impairment of vision, when seen several months after the onset, all observers agree as to the presence of optic atrophy, often of a high grade, with no other appreciable changes in the fundus. The optic atrophy may be either primary or secondary.

Local Oedema an Important Factor

There is no agreement as to the essential pathological lesion, but it is generally accepted that local oedema is an important factor. Degeneration and death of the ganglion cells of the retina and their nerve fibres, resulting in optic atrophy, has been suggested. In such an event if the disk had been swollen the atrophy would be secondary in type, otherwise it would be primary. Retrobulbar neuritis has also been suggested; and this could account for cases in which no change was found in the fundus in the early stages, and the final optic atrophy could be primary or secondary in type. This would agree with the observation of Goerlitz that the pathological changes resembled those produced by methyl alcohol and quinine. Unfortunately there are no pathological observations of the nerve trunk or tracts.

I saw the following case in consultation with Dr. J. L. Lock.

Case Record

The patient, a primipara aged 30, was confined on the evening of June 20, 1936. It was known that she had been anaemic since childhood, and two blood counts taken at an interval several years previously both showed approximately 3,500,000 red cells per c.mm. and haemoglobin 50%. She had been given occasional bottles of an iron mixture. Menstruation had been within normal limits. In spite of the anaemia she had been reasonably active.

Pregnancy was normal throughout, except that oedema of the feet and ankles of a somewhat marked degree had been observed for the last few weeks, but several examinations had not revealed any albuminuria. Confinement was uneventful, except that the loss of blood was noted to be more than normal but not sufficient to cause anxiety, and it ceased without special measures. On the following morning, June 21, she was mentally confused, unaware of her surroundings, did not realize that she had had a baby, and looked very anaemic. I saw her on the same day. The temperature was normal and the pulse about 100. There was considerable oedema of the feet. The blood pressure was 140/80. The fundi were normal. The urine contained a trace of albumin but no casts. The blood urea proved to be 32 mg. per 100 c.cm. The blood count showed 2,800,000 red cells per c.mm. and haemoglobin 36%. The white cells were approximately normal. I considered that she was suffering from anaemia of pregnancy developing on a chronic constitutional anaemia. She was given a blood transfusion and was put on liver extract and large doses of iron. Ten days later the mental condition had almost cleared and the anaemia was improving. She then complained that her vision was misty and that she could not see clearly, but little attention was given to her complaint. Three days later, for the first time, she was given a letter, and it was then discovered that she was unable to read it. On examination she was found to have bilateral central scotomata, and there was 2D of swelling of the disks

but no other fundus changes. The urine was normal and the blood count gave 3,800,000 red cells and 50% haemoglobin. Four months later the vision had recovered completely and the fundi were normal. The blood had improved to 4,500,000 red cells and 80% of haemoglobin.

It would be interesting to know if any cases have been observed in the present war.

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AN UPPER-ARM SPLINT WITH A SHOULDER YOKE AS MAIN SUPPORT

BY

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There are already a great number of different types of splints available for the treatment of injuries of the upper arm, and the introduction of yet another device is certain to arouse criticism. The method which is here described was first employed under practical conditions when existing appliances had been found to be unsatisfactory. The main defect of all the types hitherto in use seems to be that their fundamental point of support is on the hip-bone, and in order to keep this support in position it is necessary to use a large number of tight straps; in spite of these there is a marked tendency for the splint to slip downwards and forwards.

Application of the Method

While working as a military surgeon in the Abyssinian army on the southern front I found that the existing methods of splintage were in many ways unsatisfactory. Cotton-wool padding became rapidly infested with lice and bugs, and patients complained bitterly of the discomfort and irritation. In order to overcome these difficulties I tried fixing the splint by means of a main support consisting of a shoulder yoke. This method was first tried out on a soldier with a compound fracture of the humerus. The first splint was moulded on an unwounded man of approximately the same build, and was made in plaster-of-Paris on the framework of a ladder-wire splint. In the first place a plaster-of-Paris yoke was laid across the shoulders in the manner of a sailor's collar. The ladder-wire splint was incorporated from behind the middle of the yoke, and was bent over the shoulder and downwards to a point two fingerbreadths below the clavicle. From this point the splint was bent to form a right-angle and allowed to follow edgewise the anterior aspect of the upper arm, which was thus retained in the correct position. A vertical support was attached to the underside of the splint immediately below the shoulder-joint by means of string and plaster-of-Paris. On the unwounded man the splint was retained in position by adhesive plaster. A simple extension was also incorporated. The patient was well satisfied with the splint, and the experiment proved highly successful.

The broken fragments were kept in accurate position, and no daily adjustment of the splint was needed, as had been the case with other types. The patient was able to lie down in comfort while wearing the splint, and it also proved practicable to transport patients treated in this way. On one occasion a soldier wearing a yoke splint rode from Vaarda, on the southern front, to Soddu, a town in

the south-west, a journey which took twelve days. A plaster-of-Paris splint modelled on the patient is ideal for fixation of fractures of the neck of the humerus, but it may be very difficult to make when no suitable support can be found around which to fashion it. Fig. 1 shows a back

FIG. 1

FIG. 2

view of the plaster-of-Paris splint, Fig. 2 a side view. I have also constructed an aluminium splint consisting of two main parts—a yoke and an adjustable support which by means of a ball joint is applied to a steel bow fixed with screws to the yoke. A side bracket which presses against the chest is fixed to the steel bow. An extension is fitted, and a strap keeps the splint in position on the undamaged side. The support can be used equally well on either side.

Advantages

The following points are submitted as the advantages of this improved method of splintage. (1) By means of the yoke the position of the upper arm is fixed in relation to the shoulder girdle; this should lead to complete immobilization and great stability. The yoke prevents the splint from slipping downwards or forwards. (2) The splint permits free movement of the spinal column. (3) If both arms are fractured simultaneously a support can be mounted on each side. (4) Where abduction, but not extension, is required the patient may wear ordinary clothes. Extension can also be very simply incorporated.

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