treated in the Medical College and Mayo Hospitals during the year 1893.

No. of Case.	Caste.	Age.	Sex.	Suicidal or Accidental.	Result.	Opium taken or not.	Amount taken—grains.	Period—Hours before treatment.	Period before death—Hours.
1	H.	20	F.	Acc.	R.	Yes	25	24	—
2	H.	18	M.	S.	R.	Yes	40	3½	—
3	H.	40	M.	S.	D.	No	—	3½	7½ ?
4	E.I.	26	M.	S.	R.	No	40	1½ ?	—
5	E.I.	48	F.	Acc.	R.	Yes	15	1½ ?	—
6	H.	20	M.	S.	R.	No	90	24	—
7	N.X.	21	M.	S.	R.	No	180	6½	—
8	H.	20	M.	S.	R.	?	30	3½	—
9	H.	19	M.	S.	D.	No	90	2	4½ ?
10	H.	25	F.	S.	D.	No	16	Shortly	5 ?
11	H.	19	M.	Acc.	R.	Yes	35	5	—
12	H.	20	M.	S.	D.	?	50	1½	?
13	H.	22	M.	Acc.	R.	Yes	6	3½	—
14	H.	35	F.	Acc.	R.	No	—	Shortly	—
15	H.	13	F.	Acc.	R.	Yes	½	Shortly	—
16	H.	2	M.	Acc.	R.	No	2	2	—
17	H.	21	M.	Acc.	R.	?	112	5½	—
18	H.	18	F.	S.	D.	?	—	4½	7½ ?
19	H.	55	M.	Acc.	D.	Yes	360	1½	6½

H., Hindu. M., Mohammedan. N.X., Native Christian. E.I., Eurasian.

To sum up, we may say that permanganate of potassium is a strictly local antidote, it can only act upon such opium as it comes into contact with in the stomach, and can have no effect upon such as has already been absorbed. That it oxidises morphine re-excreted into the stomach does not affect this statement. The treatment is excellent as leading to thorough washing-out of the stomach, and at the same time affording a reliable indication when this is accomplished; but it is not to be expected that it will save life where a lethal quantity has already been absorbed into the circulation, nor can permanganate be regarded as a physiological antidote to opium such as eserine is to atropine.

THE MECHANISM OF CONTRE-COUP AND OF CERTAIN OTHER FORMS OF INTRACRANIAL INJURY.¹

By F. J. ALLEN, M.A., M.D.CANTAB.,
Professor of Physiology in Mason College, Birmingham.

SEVERAL theories have been put forward to explain the mechanism of cerebral injury by *contre-coup*, but none of them can be regarded as satisfactory. Among them I cannot find the following; and yet it seems too obvious to be novel; in fact it occurred to me almost instantly when years ago I first learned the existence of injuries by *contre-coup*.

It must be remembered that the brain is not everywhere supported by the cranial wall. In each position of the head the brain will be supported at certain parts, while at others there will be a layer of arachnoid fluid between the brain and dura mater. Where the arachnoid fluid would be most abundant I am not in a position to say. We cannot reason from its situation *post mortem*, nor even in cases of fracture or trephining of the skull, for in all these instances the natural circumstances have been interfered with. But since the brain has a higher specific gravity than the arachnoid fluid, it may be expected to rest at any time on that surface of the cranium which happens then to be downwards, while the arachnoid fluid should accumulate on the upward side.

The accidents which usually produce injury by *contre-coup* are those in which the patient falls and strikes the occiput or the parietal region against the ground. In the former case the frontal lobes are injured, in the latter the opposite temporo-sphenoidal lobe. In either instance the part struck is downward at the time, and the brain would be in contact with this (downward) rather than the opposite cranial wall. The accompanying diagrams represent sections of the cranium, drawn for simplicity as if the cavity were spherical, and with an exaggerated space between the brain and dura mater.

Fig. 1 represents the natural condition, the brain resting slightly flattened on the downward floor, and a slight interval existing between the brain and dura mater at the upward surface, this interval occupied by arachnoid fluid.

Fig. 1.

Fig. 2.

Now let the skull receive a sudden impulse at any point, as A, Fig. 2. I have hinted above that the impulse usually occurs at the lower part. Such an impulse will cause the comparatively rigid skull to move as a whole along the direction from A to B. But the brain, owing to its softness, lags behind and tends to flatten itself against the cranial wall on the struck side. Some direct injury may be caused by the inward bending of the elastic bone at the point struck; nevertheless, the cranial wall distributes the force of the blow over a wide area, and renders it nowhere acute. The brain substance is supported by the bone, and protected from laceration. The chief injury must occur on the opposite side, where the cranial wall tends to move away from the lagging brain, and to afford it no support. At the centre of the unsupported surface there is a point (C) from which the soft brain substance is tending to depart in several directions in the act of flattening itself, as indicated in the diagram by the arrows. At this point of greatest strain the rupture will occur. After the first centrifugal movement which causes the rupture, there will occur a return wave towards the central point, then a second centrifugal wave, and, in fact, a series of oscillations, which will tend to aggravate the first injury, and to produce the pulping of brain substance which is sometimes observed.

I have put this theory to experimental test as follows: Placing a soft hemispherical jelly, flat side downwards, on a stout board at least 1 inch thick, I strike the under surface of the board smartly by bringing it down against the surface of a table protected by a folded cloth, the cloth being intended to represent the buffer provided by the scalp, etc. If a moderate blow be given, first the jelly flattens itself momentarily, then waves of oscillation play more or less violently to and from the apex. A stronger blow causes a small ragged rupture at the apex. A still stronger blow causes the apical portion to be disintegrated and shot out in fragments, projected a foot or more into the air, leaving an obconical cavity at the top of the jelly. The behaviour of the jelly is astonishingly true to my expectations, for an impulse applied pretty evenly to the supported surface causes a breaking strain whose focus is at the centre of the unsupported surface.

INJURY BY OBLIQUE MOVEMENTS.

If the skull were struck at a point at some distance (especially at about 90 degrees) from the centre of the supported surface of the brain, there would occur (somewhat as in *contre-coup*) a shifting of the brain towards the struck side of the cranium; but the brain movement would be oblique and rolling, like the movement of a ball in a basin when the basin is suddenly moved in a horizontal direction.

A somewhat similar movement would be produced by any kind of oblique blow which communicated a rotary movement to the skull. In either of these cases the injury would be felt most on the unsupported surface of the brain, though not necessarily opposite to the external injury of the skull. Probably most cases of *contre-coup* are complicated with some degree of injury by oblique movement.

¹ Read before the Pathological and Clinical Section of the Birmingham and Midland Counties Branch of the British Medical Association.

DETACHMENT OF THE DURA MATER BY CONTRE-COUP.

If this form of injury can occur, as some observers affirm, it should be the result of exhaust or suction at the moment when the lagging brain suddenly separates from a portion of the cranial wall against which it has been lying. This explanation assumes that the brain is not in contact with the struck side of the skull—its more usual position—but is lying against the opposite side, probably from some exceptional cause. This injury is said to occur only in the squamous region, where the dura mater is less firmly attached than elsewhere.

DETACHMENT OF THE DURA MATER BY DIRECT BLOW WITHOUT FRACTURE.

Sir Charles Bell pointed out that if *post mortem* the skull be struck sharply with a mallet, although not violently enough to fracture the bone, the dura mater may be locally detached. The cause of this I would explain as follows:

Fig 3.

The space between the lines represents bone, the thick line represents the dura mater.

The bone is slightly flexible and very elastic. If a blow be received at any point, as A, Fig. 3, the bone and dura mater will be depressed for a moment, say as far as B. The excursion may be very small, but the velocity very great. The elasticity of the bone will cause it to return instantly to its first position, but the dura mater, having no such elasticity, will continue to move in the first direction (say as far as C), and thus the bone and dura mater will separate from one another, even though this may cause a momentary vacuum between them.

THE THERAPEUTICS OF RHEUMATOID ARTHRITIS.

By WM. ARMSTRONG, M.R.C.S., J.P.,
Buxton.

In studying the subject of rheumatoid arthritis, I have been greatly impressed by the various standpoints from which competent observers have viewed it; also by the many different conditions and circumstances under which it makes its appearance, and not less by the fact that treatment so markedly beneficial in other ailments, accompanied by almost similar joint symptoms, does no good—nay, sometimes even does harm—in this disease.

Most authorities seem to agree that the disease is progressive, that the prognosis is very unfavourable, and that those cases that are cured without deformity only attain that much-desired goal with difficulty.

The exceptional facilities which residence in Buxton gives for seeing this disease in its various forms has enabled me to accumulate a fairly complete series of data concerning it, and this experience has made me a firm believer in the "dystrophic" theory of its causation. This theory, first mooted by Remak, was brought prominently before the profession by Dr. W. M. Ord, whose classic address at the meeting of the British Medical Association at Belfast in 1884 first drew my attention to the subject. Remak contended that certain articular affections were due to irritative states of the spinal marrow and of the sympathetic nervous system, and he suggested the name of "arthritis myelitica" for those cases which up to then had borne the name of "arthritis deformans." Dr. Ord pointed out three important facts: (1) That certain changes in the nutrition of the joints take place through the influence of the nervous system; (2) that certain organs, especially the uterus and ovaries, have the power, through centripetal nervous influence, of producing con-

siderable excitement in the spinal cord, which frequently reflects this irritation on to certain joints; that in cases of debility and anæmia the reflex irritability of the spinal cord is greatly increased.

Whatever the variety of the disease, the subjects of it will generally be found to have had the power of resistance of their nervous systems weakened by anxiety or other similar cause, or the reflex irritability of their spinal centres increased by debility or anæmia. It is not to be wondered at if joints already the seat of lesions, whether rheumatic, gouty, or inflammatory, should take on, when either one or both of the foregoing conditions of loss of resisting power, or increase of reflex irritability in the joint centres, are present, changes of a special kind bearing a family resemblance to the local trouble from which they started, but differing greatly both as regards prognosis and treatment.

I classify my cases as follows:—First, into two divisions, according to the manner of invasion (1) acute, (2) gradual. Secondly, into groups based as far as possible on the probable exciting causes of the disease:

1. Rheumatic: (a) Cases following acute or subacute rheumatism, local or general; (b) mixed cases, subacute or chronic rheumatism running concurrently with rheumatoid arthritis.

2. Gouty: (a) Cases following acute or subacute gout; (b) cases of gout running concurrently with rheumatoid arthritis, sometimes with more or less acute gouty attacks coming on during the course of the disease.

3. Utero-ovarian: A very large class, the chief exciting causes of which seem to me metritis, menorrhagia, dysmenorrhœa, ovaritis, the climacteric period, premature menopause.

4. Phthisical and Strumous: Cases preceded by anæmia and marked debility, often having a family history of phthisis or struma.

5. Neurotic: Cases having either a neurotic family history or broken-down nervous systems; they often follow exhausting illness and other causes of depressed nerve power as influenza, anxiety, shock, worry, hard work, oversuckling, etc.

6. Local: Injury to a joint or joints, either from mechanical or inflammatory causes, or from changes of age. I include in this group many cases of monarthritis, such as the senile hip.

Important points are: (1) Early diagnosis; (2) recognition of the special variety of the disease with which we have to deal; (3) the use of remedies which will act not only upon the local joint mischief, but also upon the original cause of the disease, upon nutrition generally, and especially upon the nervous supply to the joints. As a rule, I have found the following drugs and methods more or less harmful, as indeed are all forms of treatment which exercise a debilitating influence:—Soda salicylate, potassium iodide, alkalies generally, colchicum, bromides, Turkish, Russian, and vapour baths, and very hot immersion baths whether mineral or plain. Sulphur, guaiacum, and ichthyol have, in my hands, given negative results. There are certain remedies, however, which I find most useful in nearly every case of rheumatoid arthritis, whatever its base may be, as they fulfil the indications which I have before mentioned, and upon which I would lay special stress, namely, to soothe and strengthen the nervous system, and to improve the general health, and these are galvanic baths, constant and alternating, and as an adjunct wine of cod-liver oil.

THE GALVANIC BATH.

Dr. Julius Althaus in 1872 suggested the systematic use of electricity in rheumatoid arthritis. The late Dr. Steavenson, of St. Bartholomew's, obtained some excellent results from the use of the galvanic bath, which is, in my experience, by far the most efficient method of applying electricity in the treatment of this disease. I use it in two forms (1) constant current, (2) alternating current. The bath is given at a temperature of from 92° to 94°, and lasts from ten to twenty minutes, the dosage being carefully regulated by an Edelman's galvanometer. The constant current is especially useful in cases where there is an excessive amount of pain and irritability, and is also of exceptional service in many cases of the utero-ovarian variety. The alternating current, carefully regulated as regards voltage, passes backwards and forwards through the patient, from 50 to 100 times in the