were. I think, too extensive to admit of the definite conclusions he draws. Lemoine also quotes a case of long-standing ptosis in which, at the post-mortem examination, he found a lesion in the angular gyrus, and he agreed with Landouzy as to the position of the centre. Hirt and others, more recent writers, also hold this opinion. Ferrier thinks that these conclusions are not warranted by experiment. He says, "Some such cases" (that is, of ptosis due to a small lesion in a definite area of the cortex) "have been observed in connexion with diseases of the cortex, and attempts have been made, but not, I think, successfully or in accordance with experimental lesions, to localise this centre in the angular gyrus. If a distinct volitional centre for the levator palpebræ superioris exists in the human brain I think it must be sought for at the base of the first frontal and extending partly into the second frontal convolution of the brain. Here is an area, irritation of which in the brain of the monkey causes elevation of the eyelids." Ferrier found, moreover, in applying stimulation to this area that if the stimulus were very faint elevation of the lids was the only movement that followed. Although movement of the eyelids can be seen on stimulating the angular gyrus the latent period, as pointed out by the same observer, is one-hundredth of a second longer than in the case of stimulation applied to the oculo-motor centre in the frontal lobe. Schäfer and Ferrier both found that when the angular gyrus was destroyed on both sides in the brain of a monkey, no ptosis was produced; and movements of the lids caused by stimulating this area are probably due to association with the frontal region. In one of Ferrier's experiments he extirpated the greater part of the frontal lobe in a monkey; ptosis with some disturbance of ocular movement was the only paralytic effect produced.

De Bono, as a result of the study of clinical cases, came to the conclusion that a cortical centre for the levator palpebræ superioris could be localised in the fore part of the brain. The two cases from which he chiefly drew his conclusions were both in young women affected with ptosis and subject to epileptiform attacks. In the one case the ptosis was congenital, and in the other it was of four years' duration. The epileptiform attacks in both cases began in the arms, and spread sometimes to the face and legs. De Bono thought that the lesion which caused the ptosis was also very probably the focus from which started the convulsions; and upon this he founded his theory that the centre for elevation of the lid must be closely associated with the centre for movement of the arm. Examination of the skull of the patient suffering from congenital ptosis revealed a depression about one finger's width in the zygomo-Rolandic line, 93 mm. from the external auditory meatus and 102 mm. from the orbital margin. This appeared to have resulted from an injury at birth, which was a difficult one, and it was considered by De Bono to be the cause of the ptosis. A study of similar heads showed that the depression corresponded to the anterior central (or ascending frontal) convolution at the junction of the middle with the upper two-fifths. Experiments on living dogs seemed to confirm this observation; and De Bono arrived at the conclusion that a centre for elevation of the lid of the opposite side could be localised in the anterior central convolution rather above the middle in front of the motor centre for the arm and above that for the face. These results of clinical observation are very similar to those arrived at by Ferrier's experiments.

Several cases of ptosis, as a result of blows upon the top of the head, have been reported. Thus Mr. Hulke, in the Reports of the Royal London Ophthalmic Hospital, gives such a case, which he thought was due to direct injury to the cortical centre, but it is more probable that such results are, generally at least, due to a lesion at the base. The following case, however, which is from the notes of a case which was under my own observation, points strongly, I think, to frontal localisation of the cortical centre for the levator of the eyelid.

A boy, aged twelve years, was swinging round a giant's stride when the iron wheel and arms on the top of the pole came off and fell, striking him on the top of the head above the right eye. When I first saw him, sixteen hours later, he was semi-conscious and lay quietly with both eyes closed unless irritated. He could, however, open both eyes widely and there was no paralysis of any muscle or group of muscles. On removal of the carbolie compress which had been applied a large spoonful of brain matter was seen protruding from the anterior extremity of a large jagged wound situated in the right frontal region. The wound extended about

three inches back from the brow and was about one and a half inches in width, the middle line of the head being about one and a half inches from the upper edge of the wound. Beneath this the skull was crushed in like the broken shell of an egg, making a depression in which two fingers could lie. On giving chloroform and enlarging the wound the fracture in the outer table of bone was seen to reach to the coronal suture, and the fracture of the inner table about half an inch to one inch beyond. The membranes were extensively torn, and the depressed part of the skull was driven into the brain especially in front. Owing to the extensive fracture of the inner table of the skull I had some difficulty in elevating, having to remove three circles of bone with the trephine. About two or three drachms of brain matter, over and above what had escaped before, were lost during the operation chiefly from the posterior end of the wound. The bone removed by the trephine was replaced and the wound was dressed. The patient remained in a semi-conscious condition for twelve days, and then steadily recovered. There was never any sign of meningitis, and no paralysis occurred with the exception of the left eyelid. Here ptosis appeared directly after the operation, and persisted for ten weeks. It was never absolute and gradually passed off. At the end of twelve weeks it had practically disappeared. I saw the boy occasionally during the next five months. The ptosis entirely disappeared, and so far as could be seen there were no permanent evil results from the extensive head injury from which he had suffered.

Noting the position of the fracture and its relation to the coronal suture it is seen that the posterior end of the fracture, from which the brain matter chiefly escaped during the operation, just about reaches the ascending frontal convolution, and that the level is that of the second (or middle) frontal convolution and the sulcus between the first and second convolutions. I believe that in this case the monolateral ptosis was the result of destruction of the cortical centre, probably during the elevation of the depressed bone, and that recovery was due to the function being assumed by the opposite side. I think that one may exclude the possibility of the ptosis being a nuclear paralysis because there was no ptosis to be observed sixteen hours after the accident and before the operation, but immediately after the operation ptosis was observed, which, however, did not increase in severity.

After weighing the evidence I think that the following conclusions are warranted:—1. There is a distinct cortical centre for the elevator of the upper eyelid. 2. This centre is situated in the posterior extremity of the second frontal convolution, extending probably into the first frontal convolution; that is, above and in front of that suggested by De Bono, and rather lower than the position assigned by Ferrier. 3. There is a definite relation between this centre and the levator palpebræ superioris of the opposite side, and destruction causes paralysis, temporary or permanent, of the lid on the opposite side. 4. This cortical centre is distinct from the cortical centre or centres for the other eye muscles; and therefore, as a result of a cortical lesion, ptosis may occur as a solitary paralysis; or on the other hand, in cortical paralysis of the muscles of the eye, the levator may alone escape. It is interesting to note that the blood-supply of this cortical area is double, it being supplied both by the anterior cerebral and the middle cerebral arteries, which may account for the rarity of ptosis from cerebral embolism.

Edinburgh.

FRACTURE OF THE PATELLA.

By HEATHER BIGG, F.R.C.S. EDIN.

THE immediate result of transverse fracture of the patella is that the tibia is more or less completely severed from its connexion with the extensor muscles of the thigh and the natural object of all treatment must therefore be to reunite this connexion between the two parts with as much strength and completeness as possible so that the powers of the knee joint may be restored to their fullest ability in walking. In the present days of advanced surgery this end is frequently attained by the actual operation of suturing the fragments together. But this is not always admissible and the alternative method of apposing the segments by external

means has to be adopted. My object is to show in what manner and by what apparatus not only may the closest junction be attained between the broken segments, but also how, by a graduated system of strain, the newly-laid material of junction may be cultivated into the greatest strength and endurance. Sir Astley Cooper in his "Treatise on Dislocations" lays down the proper laws of treatment in so clear a way that, although since his time the methods may have materially improved, the principles that underlie them remain classic and unchanged. "Confine" (he writes) "the leg quite straight with circular bandages above the knee for five or six weeks. Then a slight passive motion is to be begun and this must be done gently with much circumspection, that the ligament if not firmly united may not give way and the bones recede. If the union be found sufficiently firm to bear it then passive motion is to be employed from day to day until the flexion of the limb be complete. If passive motion be not used it appears that the action of the extensor muscles would never return." He goes on to write that after the passive motion has been duly used the patient should be placed on a high chair and directed to swing his leg in order to ensure under voluntary motion the gradual restoration of the powers of the muscle.

Now if the essentials of treatment be put into sequence they will be found to run as follow: (1) to approximate the fractured segments as completely as possible; (2) to maintain them in undisturbed apposition so that new material may be easily and reposedly laid down; (3) to submit this new material when formed to graduated strain in such a way as to provoke it to the greatest strength; (4) to passively and gradually renew the movements of the knee-joint from complete extension to complete flexion; and (5) to restore the extensor muscles of the thigh to active power and nutrition after their enforced atrophic quiescence. The way in which I have found all these essential conditions most perfectly satisfied is by an apparatus having the construction shown in the accompanying illustration. It consists of two lateral rods extending along each side of the leg; these are jointed at the knee and connected by four metal bands, two encircling the thigh and two the calf. A continuation of the rod on the outer side of the leg reaches to the sole of the foot where it fits into a socket in a bed-shoe if the patient is still recumbent, or a boot when the patient has started walking; this accessory rod is simply to localise the whole apparatus in a precise and fixed position on the leg. The rest of the special mechanism is at the knee. In the first place the joints of the lateral rods are "locked joints"—that is to say, they are made fixed and incapable of any movement at all when the instrument is first put on the extended and quiescent leg; but the lock is so arranged that it can by filing be cut away at will and flexion thereby

be gradually introduced until at last the complete right-angle is reached. Next there are at the joints of the rods short levers to which are attached elastic "mock-muscles" with an extensor power fully equivalent to that of the quadriceps. Lastly, there are two semilunar pads for holding the segments of the patella. The lower pad is fastened to the lateral rods by transverse straps, its object being simply to hold the lower segment steady. The upper pad has two sets of straps, one set acting transversely so as to bring the pad directly home over its segment and the

other set acting obliquely downwards in such a direction as to bring the upper segment down into apposition with the lower one.

The application of the apparatus is as follows:—At the outset, whilst the patient is still in bed, it is applied in perfect and rigid extension, and whilst the lower segment is steadied by its semilunar pad the upper segment is readily and without difficulty brought down and retained in proper apposition by its semilunar pad. When the new tissue of juncture between the segments is estimated (generally in about six weeks) to be sufficiently formed and to be capable of some incipient strain then the patient begins to walk with a stick, the instrument remaining rigid for a further week or so. Then the "locked joint" at the knee is released by amounts of about five degrees at a time every few days until the complete right angle of flexion is attained. All this while the extensor "mock muscles" are kept at their fullest tension, their object being to relieve the quadriceps of any work whatever. In every-day walking with the knee-joint mobile it is the quadriceps that flings the leg forward; the "mock muscles" of the apparatus do the same thing artificially and the quadriceps consequently has no need to come into action at all and therefore does not pull on the upper fragment of the patella, which is thus left undisturbed to follow its lower segment in apposition. When, however, flexion has been permitted to reach the right-angle then the "mock muscles" are loosened little by little and the quadriceps gradually begins to pull on the mended patella until it is allowed to do so in its full strength. Finally, the lower semilunar pad is removed whilst the upper one is slightly loosened but is left as a necessary safeguard for a few weeks longer after which the whole apparatus can be discarded.

The feature of this particular treatment is that not only are the segments safely held in apposition, but the reunited bone is submitted by controllable graduations to movement and to strain and the new tissue of union is thereby provoked into attaining perfect strength; for all tissues strengthen under graduated provocation and the fact is perhaps better illustrated in fractured patella than in any other instance. I have notes of close on 300 cases satisfactorily dealt with by this method and it may be added in conclusion that with some modifications of detail it is equally applicable to ruptured quadriceps and to ruptured ligamentum patellæ.

Wimpole-street, W.

REMARKS ON THE MORTALITY FROM CANCER.

By W. ROGER WILLIAMS, F.R.C.S. ENG.

YEAR after year the Registrar-General's reports keep on repeating that the cancer death-rate is the "highest on record," and this has been going on continually for more than half a century. Yet, so far as I can see, no effect has been produced on the great mass of professional and lay opinion by these constantly reiterated warnings. We often hear of efforts being made to stay the progress of diseases like typhoid fever, small-pox, and tuberculosis—all of which are, and for many years have been, steadily declining; so that in the future we need only improve a little on what we have done in the past to ensure their eventual extinction. But with regard to cancer the case is very different, for the conditions of life are such that if no effort is made to check the progress of this disease it will ere long be as lethal as all the above-mentioned maladies combined. That this is no imaginative statement the subjoined table shows. Yet I have no hesitation in declaring my belief that there need be no more difficulty in mitigating the prevalence of cancer—and perhaps even in eventually extinguishing the disease altogether—than there is in the case of the maladies mentioned above. I believe that the tendency to cancer may be increased by unsuitable modes of living and *vice versa*. We must therefore seek out those conditions which favour its development; and by avoiding them we shall be able to effect our object. In my opinion it is only by progress along such lines that the cure of cancer is ever likely to be effected.

In this connexion such influences as are comprised under the terms alimentation and domestication seem to