tumour is materially reduced, and does not extend two inches to the left of the umbilicus; it is also softer in structure; the patient feels well.

CASE III.—K. F., aged 26, a slight, healthy, unmarried girl, noticed a swelling of her abdomen four years ago, which has steadily increased; she had no profuse menstruation at any time. I saw her first in March, 1887, and she was then seen by two London specialists, who agreed that she had a fast-growing, pedunculated myoma, and proposed hysterectomy.

In November, 1887, when I began Apostoli's treatment for her, the abdomen was thirty-four inches and a half in circumference, and the tumour, a very movable one, filled the right side of the abdomen, and extended two inches and a half to the left of the umbilicus. I applied the negative electrode to the interior of the uterus, which was four inches in depth. I commenced with 20 cells (Coxeter), and obtained 100 milliampères; this strength on subsequent occasions I gradually increased to 25 cells and 145 milliampères; each application lasted ten minutes, and ten or twelve days elapsed between each. There was improvement after each electrification, and now, after eight applications, the abdomen measures thirty-two inches, and the tumour cannot be felt to the left of the umbilicus.

REMARKS.—I applied the electricity to the patients placed in the obstetrical position; and, having passed a Fergusson's speculum, I carefully syringed the vagina with an antiseptic solution before inserting the internal electrode, and again after the operation was completed. The internal electrode was steeped before using in 1 in 20 carbolic lotion. I did no electrification within ten days of the preceding one; antiseptic syringing was done by the patients twice daily in the intervals between each operation. The electricity was never applied for more than ten minutes, and cell after cell was gradually added, up to the strength determined upon, and again slowly diminished in the same way. I use Apostoli's wet clay abdominal electrode, a water rheostat, and a Gaiffe's galvanometer; also flexible platinum electrodes for the uterus, of small calibre, made for me by Coxeter, and insulated up to two inches from the point. Owing to the energetic action of the negative pole, I should not venture to apply more than 150 milliampères of electricity to the uterus.

PREVENTIVE SURGERY, AS ILLUSTRATED IN KNOCK-KNEE AND FLAT-FOOT.¹

By T. S. ELLIS, M.R.C.S.,

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PREVENTIVE Surgery, though it sounds unfamiliar, is, I submit, a legitimate expression. As Preventive Medicine sometimes teaches how to cure diseases by presenting, in specially pronounced form, the conditions under which they do not occur, so a study of the means by which deformities are prevented may teach us how to deal with them when actually existing. Let me illustrate this by two kindred deformities having much in common, knock-knee and flat-foot, as acquired independently of paralysis and of bone disease. Both are exaggerations of naturally existing curves. In each the sequence of events is the same—failure of muscular support, yielding of ligaments, altered contour of bone surface. And in each case, also, the leading indication for treatment is the same—to strengthen, by action, the muscles which, in the full exercise of their functions, prevent these deformities.

In the case of knock-knee, the direct influence of muscular action, in cure or prevention, does not seem to be recognised at all by writers. Of the two most recent known to me, Mr. Owen (*Dictionary of Surgery*, Genu Valgum) refers to exercise only to forbid it; and Mr. Arbuthnot Lane (*Guy's Hospital Reports*, 1887) advises it only because by this means "the firmness of the joints and ligaments, and the density and resistance of the osseous system, will be improved." That spontaneous recoveries do sometimes occur is well known, and that muscular exercise will completely remove the deformity I have myself seen, although unable until recently to explain how. This I will now endeavour to show. According to the parallelogram of forces, a well known law, if a force acting in the line *a* to *b* (Fig. 1) be opposed by a force acting in the line *a* to *c*, the resultant will be in the diagonal of the completed parallelogram, or towards *d*. But all the muscles attached to the leg bones below and to the pelvis above do act in the line

a to *b*, while the weight of the body acts in the line *a* to *c*. These muscles draw the knee towards a straight line between the foot and the pelvis, when, as in the erect position, the foot is a fixed point. It is important, also, to realise that the peroneus longus, which abducts the foot when free to move, can only abduct the knee when the foot is fixed; so, also, the gluteus medius, which abducts thigh and leg together, can only act on the knee when the foot is fixed. These effects are fully seen in a wooden model (shown), where the part representing the body is kept upright by fixed guides, as it moves up and down, when the effect of the various muscles in correcting knock-knee is demonstrated. This is done by means of strong elastic bands, the parts of the model representing the thigh and leg being united by hinges.

I am fully mindful that in the body, the muscles attached to the leg and to the pelvis are attached also to the thigh, but this does not affect the result described. I recognise, also, that the downward thrust on the knee acts in the line *b* to *a*. This, too, is immaterial, the muscular force being strong enough to overcome it. My contention is that the muscles concerned in raising the body to the full height, and those which draw down the pelvis in opposition to resistance from above, pull the knee towards a straight line between the foot and the pelvis, and that their agency ought to be utilised in correcting knock-knee. In actual practice I have

Fig. 1.

found the treatment thus indicated to be highly satisfactory, so much so as to justify a confident opinion that it would be found to be sufficient even for the worst cases. And indeed, as appears to me, if it be admitted that failure of muscular support leads to yielding of ligaments and altered bony surfaces in joints; that vigorous use of muscles makes them strong and taut, even when only in passive contraction; that, in this condition, they not only relax, and thus renew the over-stretched ligaments, but also, by exerting constant pressure on the bony surfaces of the joints, re-

¹ Read before the Gloucestershire Branch.

modify their altered contours—if this be admitted, and if the explanation of knock-knee which I have given be accepted, then I claim that such success accords with reasonable probability.

This view of knock-knee, its prevention and cure—never, so far as I know, given before—I offer now with the more confidence and the more pleasure because it was at a meeting of this Branch, nearly fourteen years ago, that I first pointed out that the arch of the foot is formed, is maintained, and may, when destroyed, be restored, by muscular action. I then narrated how, after an accident which had torn through the calcaneo-scapoid ligament in my own foot, I had myself been the subject of flat-foot in the worst form for more than six years; that, in seeking to discover by what means flat-foot is in Nature prevented, I had, by an observation on a horse, been induced to regard it as a universal law that ligaments liable to great strain are supported by muscles, and from that law had deduced the probability that, if I could only renew the function of the flexor longus pollicis, I might restore my flattened foot. I then described how, after six months' persevering application of the principle involved, a foot which for six years had never risen to tiptoe had become able to bear the strain of hopping over a footstool. To this I may now add that it has never since given me serious trouble, although the original displacements are still evident. I did not, however, at that time convince anyone² that my recovery was wholly due to

Fig. 2.

exercise, and I had not the boldness to send my paper to a medical journal. Three years later I restated my views in a pamphlet of which Mr. Holmes gave a favourable notice in his *Principles of Surgery* on the first appearance of that book. To those views I have ever since adhered, maintaining, as leading principles in relation to flat-foot: "For prevention promote, for restoration renew, the functions of the flexor longus pollicis." This being done, action of the other important muscles will be attendant. Not so the converse. Distortion of the great toe may suspend the action of its flexor alone. I find it difficult to understand how anyone can consider the position of the tendon (depicted in Fig. 2), having the same relation to the arch as a bowstring to a bow, without recognising that so strong a muscle must exercise a most important influence on the flexible arch, or arc which its tendon subtends. And yet, in all the writings I know where flat-foot and the construction of the plantar arch is discussed—the list is a long one³—there is not one

where the writer has regarded this muscle as of sufficient importance even to call for special mention. Perhaps, if the place of the tendon could be occupied by the fleshy mass of the muscle, and the tendon inserted in the leg, the effect of action on the arch would be better realised. We call it the flexor of the great toe. The far more important and far more common action is to assist in raising the body, acting from the straight toe as the fixed point. The tendon is, in effect, the most important of those forming the counterpart of the single tendon, which in the horse passes round the hock (the true heel), and is inserted at the toe. Tilt the sketch (Fig. 2) on one side, imagine an exaggerated toe-nail, a much-elongated metatarsal bone, and the tibia inclined at a less angle, and we have a horse's leg. Just as the tightening of the tendon of the "flexor perforans" in the rearing position of the horse, the tiptoe of man, relieves the enormous strain on the ligaments binding together the bones between the hock and the hoof, so do the corresponding tendons relieve the ligaments of the human foot as the heel is raised in every step. And, further, insufficient support of these ligaments will lead to "straight joints" in one case, as it does to the counterpart, flat-foot, in the other. I cannot describe how much I owe to this bit of comparative physiology applied to surgery.

I have recorded in the *Lancet* of February 9th, 1884, with my own case, that of a farrier's apprentice, who was under my care in the Gloucester Infirmary some fifteen years ago, with feet so flat and so painful that he could not walk across the ward. He was put in the way of proper exercises, and ultimately became a distinguished dancer in the 2nd Life Guards. I have also there described (September 25th, 1886) the best exercise I know for producing a speedy result in a bad case of flat-foot, and I now say the same in regard to knock-knee. It consists in raising a weight by means of a cord running over pulleys. The object is to bring the foot to extreme tiptoe, the knee and hip to full extension (this with the inspiration, so as to get the benefit of the Silvester method of artificial respiration added to natural breathing); then, after a pause, to suddenly and vigorously draw downwards. Turning a wheel, placed so high that the handle is with difficulty reached when at the highest part of the cycle is a similar movement, available if the patient be strong enough, and having the advantage of being less irksome. Indeed it may be made to combine useful work. So also may pumping, if the handle be placed high enough. Bell-ringing is also an excellent exercise. I cannot imagine it to be possible that persons habitually engaged in such strictly natural occupation as reaching up to and drawing down the boughs of trees would be knock-kneed or flat footed. It is remarkable that no such movement exists in the ordinary occupation of life; it has no place in ordinary gymnastic exercises, and, so far as the book of the Zander Institute shows, is not used even there. On its value in stimulating functional activity this is not the time to insist. Everything, however, which promotes the general health is important; so is everything which promotes nutrition of the muscles, dry friction, massage, and so on. Still, I would insist, on muscular action reliance must after all be mainly placed. In those forms of it described, especially in the first, that great impediment to exercise in these cases, the weight of the body, is partially counter-balanced; but good walking must be the aim, in view of a permanent cure, and should as soon as possible be practised in moderation. Let the toes be pointed downwards and forwards—the position of strength and therefore of activity; not outwards—the position of relaxed ligaments and, therefore, of rest. Let the heel be vigorously raised at every step, the knee being fully straightened. There is nothing strained in this, it is simply good walking. Standing should of course be avoided unless it be with constant springing up on the toes, an excellent exercise. As far as possible, especially in the early stages of treatment, all exercises should be done with bare feet. Remember that the natural plane of movement of the great toe is oblique, downwards and inwards, and take care that neither boots nor socks interfere with it, as will probably have been the case. Of the great importance of this point I have spoken in an article on Deformities of the Great Toe, in the *JOURNAL* of May 20th, 1887. In the treatment of flat-foot I never use supports of any kind. I believe that they do more harm in preventing free action of the short flexor muscles than they do good in propping up the arch. During many years I have seen the worst of cases recover without them. I am equally certain that for knock-knee

² Mr. Willett was, I think, the first convert to my views. I learned, years afterwards, that a friendly conversation in the square at St. Bartholomew's had left more impression than I supposed.

³ It includes Professor Humphry, "Flat-foot and Construction of Plantar Arch," *Lancet*, March 20th, 1886; Professor Sayre, *Orthopedic Surgery*; Professor Ogston, *Lancet*, January 28th, 1884; Dr. Little, *System of Surgery*; Mr. Bernard Roth, *BRITISH MEDICAL JOURNAL*, Nov. 18th, 1882, *Dictionary of Surgery*, New York Medical Record, March 17th, 1888; Mr. Symington, *Journal of Anatomy and Physiology*, vol. xix; Mr. Golding-Bird, *Guy's Hospital Reports*, 1883; Mr.

Arbuthnot Lane, *Guy's Hospital Reports*, 1887; Hancock, *Anatomy and Surgery of Foot*; Noble Smith, *BRITISH MEDICAL JOURNAL*, June 9th, 1883, "Surgery of Deformities"; and Mr. Mayo Collier, *Lancet*, Sept. 8th, 1886.

they are in principle wrong, and in practice unnecessary. So also of tenotomies in either deformity. Osteotomies and resections I can only regard as unwarrantable mutilations.

TIMES OF SOLDIERS' MEALS.

By J. HICKMAN,
Army Medical Staff.

At present the usual hours for soldiers' meals are: breakfast, 8 A.M.; dinner, 1 P.M.; tea, 4.30 or 5 P.M. The early morning parades are generally about 6 or 6.30, or in summer may be at 5—that is, men coming in late at night are turned out to parade without having had anything to eat. Even considered from the point of view of discipline this practice is to be deprecated; men having partaken of some nourishment, any way a cup of coffee, are in a better humour with themselves and their superiors, and insubordination, absence, and lateness at parades will be found to sensibly diminish. Many go so far as to advocate a regular meal at the time of rising, but it is generally accepted that light refreshment is sufficient to maintain the equilibrium till the breakfast time; hot coffee with plenty of milk may be advised; it is a stimulant to the system, invigorating without depressing. The cooking to provide a full meal could hardly be managed; two good meals are sufficient in the day, and if a hearty breakfast were taken too soon, the interval between it and the other meal would be too great; the work intervening is only an hour's parade, after which breakfast can be taken with leisure and appetite. The morning parade work should not be excessive; no fatiguing duties should be undertaken, as much unaccustomed exercise is likely to be followed by languor through the day. In cold or rainy weather this food before leaving the barrack-room should be specially insisted on. In every campaign, before starting the day's work or march, the rules lay down that soup, erbswurst, or coffee is to be issued. In India early rising is universal, and the habit is generally adopted; on the march the coffee-shop is an institution, and the men avail themselves eagerly of it. It is the universal opinion of medical men abroad that in places where malarious fevers are prevalent the susceptibility to their influence is much increased by starting for the day without food.

In the Aldershot cavalry barracks the men can get a good cup of coffee and a bun for a penny, and a cup of Moore's cocoa and milk, or a tumbler of milk and a biscuit, could be sold for less probably.

This early issue of refreshment should not be dependent on the caprice or wish of the regimental authorities, or on the pocket of the soldier; it should be embodied in the Queen's Regulations that no morning work should be commenced without an attempt to restore the waste of the body during fasting and sleep.

Breakfast only wants a few words; no alteration in the hour can be suggested. According to Dr. Edward Smith the daily distribution of food, supposing a physiological diet of 4,300 grains of carbon with 200 grains of nitrogen be taken, should be:

	C.	N.
For breakfast	1,500	70
For dinner	1,800	90
For supper	1,000	40
	4,300	200

or the total daily food should be distributed amongst them by allotting three parts to the first, four to the second, and two to the third. When dinner is eaten late 4-9ths of the supply may be eaten then and half that quantity at luncheon.

This division would assume that the system requires meat twice a day, to cover the wear and tear and to supply nitrogen, and to produce the highest state of health in the adult. In the recruit whose muscles are developing, and whose actual and reserved energy it is proposed to increase, the bodily waste is far more active, and he requires nitrogenous food twice a day, at breakfast and at midday dinner, and on no account in the after part of the day. In nitrogenous food is comprised fish, bacon, sausage, eggs, etc., with any of which breakfast can be varied.

It need hardly be said that breakfast should be a substantial meal; the digestion early in the day is active, and the work of the day is to follow. Cocoa, milk, hominy, or oatmeal porridge are amongst the best articles; the unsuccessful efforts to introduce into household use "wholemeal" (not simply bran) bread might be renewed and enforced in soldiers' diet.

Now, as to the time for dinner. It is generally assumed that an

ordinary meal is, in a healthy man, completely digested and passed out of the stomach in about four hours. Then, if we add a period of two hours for rest to the stomach, food would appear to be required at intervals of six hours. This is what experience teaches, and what is practically adopted. Sleep means a great diminution of bodily activity, and this greater interval can be accounted for. Breakfast being taken at 8, the midday meal should be ready at about 1, the time chosen by working men and the middle class generally, in schools, prisons, and all institutions. It is laid down that the chief meal of the day, the full meal (by whatever name it is called) should be taken at any hour when active occupation, bodily and mental, can be suspended for from one hour and a half to two hours; in other words, it is not found conducive to health to take a full meal in the midst of the day's work. This does not seem to agree with the popular habit. If soldiers had their dinners late, after they had finished their duties, they would probably remain more in barracks. The question of late dinners for shop-people and clerks has been elaborately argued by Dr. Dobell in a circular addressed to employers of labour, 1852. In the case of the soldier the suggestion may raise a smile, but is worthy of consideration.

Except fatigues, punishment drills, or guard occurring at intervals, the duty of the foot soldier after dinner consists of only an hour's parade, and old soldiers are even exempt from this. In the mounted branches, stables have to be attended, and many other duties may present themselves. If the present agitation for the "square" meal in the afternoon can be justified by the proportion of afternoon work, the mounted corps will surely have a primary claim to this indulgence. The thing to be remembered is to allow time for rest before and after the meal, and the afternoon drill should be delayed to further this object. To recapitulate: to those whose physical powers have been taxed the short perfect rest before is to be recommended; and when the dinner is finished at least an hour should be given to physical tranquillity. After this hour gastric digestion will be established, and the blood and nervous energy employed in the process will no longer be required, and can be devoted to another form of animal force.

In practice, no doubt, work immediately after a meal interferes with digestion, but this only applies to hard work, and most of the working classes can secure a quiet hour for the enjoyment of their dinner. Tea is taken at from 4 to 5 P.M. It really requires little comment. Perhaps the hour is too early, and makes the interval between it and breakfast too long. If delayed later, it would deprive the soldier of his evening walk, and the change would be received with grumbling. It can be urged, while the soldier carries into the army the hours of eating of the working classes in his other meals, in his tea and supper he anticipates his former habits by several hours; it really adds to the necessity of further nourishment before turning in, as going to bed with an empty stomach is to be avoided. Coffee or tea, with bread and butter, lettuce, onions, watercress, or other light things, which are wholesome, and are better and more economical than meat; this is merely added in case the purchase of meat should be made by the soldier. Meat teas are not to be commended; tea is not adapted to accompany meat in the digestion, and is very likely to cause dyspeptic troubles. In many instances the hungry recruit has eaten his portion of bread for his breakfast, and there is absolutely nothing left for his supper. A modification of the rules for issuing bread seems imperatively required. We are led to conclude that the hour of dinner is, like the laws of the Medes and Persians, unalterable, though it might be a little later. As regards supper, in an economic and scientific point of view, it certainly should be postponed for another hour or two. On service, in camps of exercise, or foreign stations generally, where the outside amusements of the soldier are few, the change could be made with advantage.

After 5 o'clock meal the regulations do not provide any more for the soldier, who, as long as he has money in his pocket, generally gets something at the regimental canteen or recreation room bar; this is merely private expenditure, with which no interference can be made. The question naturally arises whether this absolutely necessary amount of nourishment should be dependent on such fleeting and precarious finances.

In the beginning of this paper the dangers of a long fast were insisted on, especially in the case of growing lads. They are too exhausted to sleep comfortably, to rise with vigour, or to enjoy breakfast. The system is weakened and the digestive powers not ready when called upon, or there is a temptation to ravenous haste. The remedy for this is the issue of soup from the cook-house between certain hours in the evening. This basin of soup