SUBCUTANEOUS OSTEOTOMY IN YOUNG CHILDREN.*

By ROBERT WILLIAM PARKER, M.R.C.S.,
Assistant Surgeon to the East London Children's Hospital, etc.

ALTHOUGH the hospital has afforded me abundant material for osteotomy in different kinds of deformity of the long bones of the lower extremity, I shall nevertheless chiefly confine myself in this paper to the subject of knock-knee. Osteotomy is now so thoroughly established as a surgical operation, that an apology for undertaking it is no longer needful; of all surgical operations, there are few, conferring so great a benefit, which are burdened with less mortality than this one. Out of fifty osteotomies, performed on children varying in age from three to thirteen, I have not had one death; and in only one case has there been any suppuration. This occurred in a little boy aged about four, on whom I operated for bow-legs. The left tibia was chiseled, and healed very satisfactorily; after two or three weeks the right one was operated on. All went well for a time; then some erysipelatoid oedema of the soft parts set in, and the boy was very ill for some days. Under treatment, however, I am glad to add he recovered with a straight limb.

I ought to say that, knowing the tendency which the slighter forms of rickety curvature of the long bones have to disappear spontaneously, I only proceed to osteotomy after having had the cases under observation for about three or four months, during which cod-liver oil and steel wine are tried, and also the use of splints kept on with India-rubber bandages. The facility with which these rubber bandages are applied by the lay public is a great recommendation; but a still greater one is the fact, that they not only never get loose, but, on the contrary, they rather tend to become tighter; thus they keep up a constant traction. If anything be likely to overcome deformity, it is constant pressure and traction such as this. The splint, which should be hollowed out somewhat and well padded, is placed on the inside of the leg; it need not reach beyond the foot, and then it will not interfere with walking. For I hold it very desirable that the patients should be out and about, rather than shut up in unhealthy rooms, fresh air being very essential for rickety children. In slight cases, much may be accomplished by this means, *if time and some little trouble be given to the case.*

I will now speak of genu valgum. It seems to me that we may divide the cases into two chief classes: the complicated and the simple. By the complicated, I mean where, in addition to a certain amount of genu valgum, there are rickety curvatures of the long bones, by which the former deformity is aggravated. By the simple genu valgum, I mean cases in which there is no other deformity, no curvatures either of tibia or of femur. The treatment must of course vary with the nature of the deformity. Speaking generally, it may be said that, the less a genu valgum is complicated, the more certain it is to be overcome by the condyle operation. In the complicated cases, very much may be effected by straight splints and the India-rubber bandages, or by the use of various orthopaedic instruments. Even in these cases, however, if there be any obvious overgrowth of the internal condyle, I should recommend an operation; for it allows of so much immediate improvement in the position of the leg, that the remaining deformity of the femur or of the tibia can be the more easily treated. It is true, too, that a considerable degree of simple knock-knee may be overcome without any operation whatever, if the patient can provide himself with suitable instruments and have the almost daily supervision of his surgeon for a long period. But among the poor children who attend the out-patient departments of our hospitals there is a double difficulty to be met: they are too poor to provide themselves with instruments, and they cannot have the surgical supervision without which the best instrument is almost useless. Thus hitherto there has not been any available remedy for this class of persons for a deformity which is by no means uncommon, and we have been under the disagreeable necessity of sending away the severer cases without relief.

It has long been known that a hypertrophic lengthening of the internal condyle of the femur is the most frequent pathological condition which leads to the production of simple genu valgum. Many other conditions have been assigned. I have myself seen cases in which I could not demonstrate overgrowth in the condyle; in two cases now under care, I believe it is due to overgrowth of the internal tuberosity of the tibia; and I have several times seen how curvatures of the long bones may simulate this deformity. Nevertheless, the broad fact remains, that in a large majority of cases, this undue lengthening of the internal condyle is the cause of the deformity. I am the more disposed to regard this as the real source of the disease, because, in highly marked cases even,

after the condyle has been loosened, the deformity can always be overcome.

We owe an especial acknowledgment to Dr. A. Ogston of Aberdeen for having first applied this knowledge to the purposes of surgery; for although other operations had from time to time been proposed and undertaken, none were comparable to Ogston's at the time when it was first published. In recording this, we must not forget to mention the obligation we owe to Listerism; without such a protection no surgeon would have ventured thus deliberately to open the largest joint in the body. In the next place, I think that great praise is due to Mr. Reeves for having improved on Ogston, by suggesting a subcutaneous osteotomy; and further, one which may frequently be done without even entering the joint.

Personally, I have not adopted Ogston's operation; I have not even done it once. Reeves' modification seems to me a less serious operation, and just as effective. Since its introduction, therefore, I have given up all other operations for uncomplicated genu valgum. In children, I believe it can be performed without entering the joint, for the layer of encrusting cartilage, together with its synovial lining, would stretch rather than crack sharply off, as was probably the case in adults. Fortunately for my patients, I have had no opportunity of putting this opinion to the test of the *post mortem* room; but the clinical experience of upwards of twenty-five cases seems to bear me out. Among these cases I have now and then had some effusion into the joint—about three or four times in all. On one occasion, in dividing the condyle, which was very soft, I felt the chisel move too freely, and I anticipated what really occurred—effusion into the joint. Though well marked, it was not really severe, and it quickly yielded to an India-rubber bandage and an ice-bag.

I now generally use the carbolic spray at all these operations, and apply a small Lister's dressing to the wound.

The operation is performed thus. An incision is made with a small scalpel down to the condyle. It should be made about its centre from before backwards; this will correspond to the axis of the femur, and will be about midway between the tendon of the adductor magnus and the inner margin of the patella. The chisel is then introduced, and the condyle is gradually separated. It is well to avoid entering the condyle too far in any one given place; the attempt should rather be made to chisel it equally in each direction by making the handle of the chisel describe the arc of a circle while the mallet is being gently used. If the chisel be sharp, a mallet will not be necessary when operating on young children. After the condyle has been freely loosened, *redressement forcé* is practised until the deformity is corrected. A little over-correction even is desirable. Then plaster-of-Paris bandages are applied from the toes upwards, and the limb is held in position until the plaster is hard. An ice-bag is kept applied for three or four days. There is not much pain subsequently, and rarely any constitutional disturbance whatever. After an interval of from four to eight days, the plaster bandages may be removed, and also the Lister dressing. It will generally be found that the limbs can be *voluntarily flexed to about two-thirds of their extent immediately afterwards*. The amount of stiffness varies with the length of time which has elapsed since the operation. If the joint have not been entered, there will scarcely be stiffness at all. But under any circumstances, I would dissuade from any movements but those of which the patient is voluntarily capable. I should not propose to allow the patient to walk about so soon as this, as it is impossible for the process of union and repair to have been completed thus early. In some of my earlier cases, I waited for three weeks, in others for a fortnight, before commencing movements. I have gradually reduced the time, as experience has shown it to be possible. *Voluntary movements* are always to be preferred, and should be practised every day.

Since experience shows that genu valgum (*vide Holmes's Surgery: its Principles and Practice*, 1st edit., p. 481) does not in any way tend to spontaneous cure, I have in well marked cases not hesitated to operate on children even as young as three years. I have been led on to this by the remarkably little effect which the operation seems to exercise upon them, and by the feeling that it is therefore better to relieve them early in life of a deformity which materially interferes with their own comfort, as well as with that of their families. A child with well marked genu valgum requires very much more care and nursing than another one whose legs are straight and strong. It is the additional labour and responsibility involved in the care of a weakly child which often constitute, for a poor family, the proverbial "last straw which breaks the camel's back". I think, therefore, it is preferable to operate early in suitable cases, seeing how harmlessly it can be done, rather than to wait for two or three years, simply because our patient happens to be a young child.

There is also another argument in favour of an early operation in

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children when the knee-deformity is at all pronounced. It is, that a genu valgum cannot last long without giving rise to a kind of spurious talipes valgus, which then materially complicates the case. In consequence of the obliquity of the leg, the weight of the body falls largely on the inner part of the ankle-joint, as may be seen in Figs. 3 and 4, especially in the right foot. This unusual and too localised pressure on rickety joints little by little causes the ligaments to yield, and a talipes valgus results, more or less complete in proportion as the knee-deformity has lasted a longer or shorter period.

For the purposes of illustration, I append very brief notes of some of my cases.*

CASE I.—William B., aged 6, a healthy-looking child, had a well-marked double genu valgum, which was said to be getting worse. Reeves's operation was performed on June 28th, 1878, on the left leg, being my first operation. A straight splint was then applied, and an ice-bag over the knee. On August 2nd, the right leg was operated on in a similar manner, and the same after-treatment was adopted. A pressure-sore quickly formed on the outer side of the leg, over the bony prominence of the head of the fibula, which gave us some trouble, inasmuch as it interfered with the wearing of the splint. I may say that this operation, viewed in the light of my later ones, was only partially successful. The boy continued to wear straight splints, and subsequently an India-rubber bandage, for some months; and when I last saw him, a few weeks ago, his legs were sound and nearly straight.

I am not ashamed to own that I felt somewhat nervous in deliberately chiseling so nearly into the healthy knee-joint; this accounted for my not loosening the internal condyle of the femur sufficiently to allow the leg to come quite straight; the operator, therefore, rather than the operation must be blamed for the but partial success. I ought also to refer to the plan of after-treatment, which is answerable for something in this case; since this time, and in consequence of the trouble from pressure-sores in this case, I have relinquished the use of splints, and now only use plaster-of-Paris bandages. The leg having been forcibly straightened, plaster bandages are applied; the leg must be held in the required position until they are hard and dry.

CASE II.—H. O. D., aged $5\frac{1}{2}$, was admitted on October 1st, 1878. He was a rickety child, with curvature of the femora and of the tibiae, and also with double genu valgum, especially marked on the right side. It is stated in the case-book (by Mr. H. R. Hutton) that "the thighs being put together with the patella forwards and the internal condyles touching, there is a distance of eight inches between the malleoli". Reeves's operation was done on October 8th on the right knee. Plaster-of-Paris bandages were used. There was no rise of temperature. The first dressings were removed on the eighth day; it was found that the boy could semiflex the joint without any pain. The left knee was then operated on in a similar manner, and the dressings were again removed on the eighth day. From this time, all appliances were left off. He was exhibited at the Clinical Society on November 8th. Figs. 1 and 2

Fig. 1.

Fig. 2.

show the boy's condition before and after operation. He was seen by me at the Children's Hospital in July of this present year, quite healthy and well, and with his genu valgum cured.

CASE III.—H. P., aged 6, was admitted under Mr. Reeves and kindly transferred to my care. She was the only surviving child of four. She was extremely rickety; her ligaments were loose; the long bones were curved. When she stood, the left knee was completely behind the right one, and the malleoli even then were some inches apart. Her parents were both poor and neglectful. Reeves's operation was performed on

the left leg on April 4th; plaster bandages as usual. On April 29th, the right leg was operated on the same way. The condyles were quite soft, so that they could be, and were, cut with the chisel without the aid of a mallet; the chisel accidentally cut its way into the joints, and there was considerable effusion into the left knee, and slighter effusion into the right one. An India-rubber bandage and an ice-bag were applied, and the effusion quickly subsided. The genu valgum was cured. Of course, the rickety curvatures and the loose ligaments remained *in statu quo*. The notes were taken by Mr. R. E. R. Morse, as also the following.

CASE IV.—James T., aged 5; a severe case of genu valgum. The deformity had first become apparent twelve months ago. It was said to be increasing rapidly. The usual operation and after-treatment were adopted. Figs. 3 and 4 show the boy's condition before and after the operation. I

Fig. 3.

Fig. 4.

have a third photograph, showing the amount of flexion, which was voluntarily possible on the eleventh day after the operation. It was about three-quarters of the maximum. There was not the slightest effusion into either joint. The legs were operated on at four days' interval between the first and second.

CASE V.—John M., aged 3, was admitted under my colleague Mr. A. Caesar, and subsequently transferred to my care. He was an exceedingly rickety child. The epiphyses generally were large; the tibiae were also curved. The boy had well marked double genu valgum, which was said to be becoming rapidly worse. His parents brought him to the hospital expressly to have "something done; they knew of some other child which had been cured". I operated on both knees on the same day, June 17th, 1879, putting up the legs in plaster bandages afterwards; ice-bags were then applied. The deformity was quite overcome. Four days later, the plaster was removed; and on the following day the photograph, of which Fig. 5 is a copy, was taken. It

Fig. 5.

shows the amount of flexion of the joint which was voluntarily possible thus early after the operation, and to my mind completely proves that this form of operation may, if carefully performed, be completely *extra-articular*; for I cannot think that such movement would have been voluntarily performed if the joints had been opened.

CASE VI.—Joseph T., aged $5\frac{1}{2}$, had a double genu valgum. The usual operation and the after-treatment were followed. There was very slight effusion into the joints. I had to use considerable force in straightening the limbs, and then did not succeed entirely to my satisfaction. I record the case, for it is probable that the line of the incision into the condyle was too oblique, that is, *not sufficiently corresponding to the axis of the femur itself*. It will be obvious to anyone, that the difficulty of displacing the loosened condyle upwards sufficiently to allow the leg to be brought into the straight line, will be in proportion as the incision into it is more or less oblique. I am inclined to regard the slight effusion into the joint in this particular case as the result of the pressure which was necessary to straighten the limb.

* Photographs of the cases, before and after operation, were shewn. The accompanying figures were copied from the photographs, being selected as typical cases.

In doing this operation, it is to be borne in mind that a sufficiency of the condyle must be loosened; otherwise, in straightening the limb, the internal tuberosity of the tibia will impinge on the stump of the condyle, and this will effectually prevent a complete reduction of the deformity. The chisel ought to be so directed that the lowest part of the incision shall correspond to the lowest level of the external condyle, which should always be carefully ascertained before an operation is commenced.

I must acknowledge my great indebtedness to my surgical colleagues Mr. Arthur Cæsar and Mr. Reeves for many of the cases, and for their beds which they placed at my disposal, as well as for help at the operations.

SHORT NOTES OF A DOZEN CASES OF SUBCUTANEOUS OSTEOTOMY.*

By THOMAS JONES, F.R.C.S., M.B.,
Surgeon to the Children's Hospital, Pendlebury, Manchester.†

As osteotomy is one of the subjects chosen for discussion at the Surgical Section of this meeting, I have been induced to record very briefly the chief points of interest in some of the cases which have been under my care. These cases may be conveniently arranged in three groups.

1. Those rachitic distortions of the legs in which the tibia was operated upon.

2. Those in which there has been much inbending of the knees, relieved by division of the internal condyle of the femur.

3. A case of osseous ankylosis of the hip-joint in a flexed position, straightened by dividing neck of femur.

I will now proceed to relate as much of the history of each case as is considered necessary.

CASE I.—John Edward H., aged 6, was admitted into the Children's Hospital, Pendlebury, on August 16th, 1878. For some months previous to this, he had been brought as an out-patient. He had had splints applied with the object of correcting the deformity of his legs, but did not derive much, if any, benefit. The mother stated that the boy commenced to walk at eighteen months of age. At that time, his legs were quite straight; they, however, soon gave way. He was very late in cutting his teeth. The wrists were expanded and the head was large. The ribs were distinctly "beaded". Both legs were bent outwards and slightly forwards. On August 29th, the right tibia was divided subcutaneously with a saw about two inches above the ankle-joint. The wound was covered with lint soaked in collodion, and the limb placed in the straight position between two side-splints. On September 21st, the left tibia was operated upon in a similar manner. The progress of the case was uninterruptedly good; and, when the boy was discharged on September 30th, his legs were quite firm and straight. On July 29th, 1879, his legs were in as good a position as on the day he was discharged.

CASE II.—Sarah N., aged 5, was admitted November 29th, 1878. She was very late in cutting her teeth. She began to walk when a year and seven months old. The right leg was curved outwards and to a certain extent forwards. On December 7th, the right tibia was divided subcutaneously with a saw at the point of greatest concavity. She was discharged cured on January 7th, 1879.

CASE III.—Jessie Ward, aged 5, was admitted May 24th, 1878. The child was brought up by hand. She had many evidences of rickets in the expanded epiphyses, and a large head with flat top. Both legs were very much deformed; the right one was the worse of the two. On May 25th, the left tibia was fractured and the leg forcibly straightened. On June 15th, the right tibia was divided and the limb placed on a back-splint. She was discharged with the limbs in good position on September 2nd, 1878.

CASE IV.—Edwin H., aged 4½, was admitted February 24th, 1878. This boy began to walk when two years and a half old. Seven or eight months afterwards, his mother detected his legs becoming bent; since then the deformity had gradually increased. He was a stout, light haired, intelligent boy, with a large rickety head and beaded ribs. The extremities of the long bones were enlarged, and the legs curved in the upper half. This curvature differed very markedly from that which is usually found in the lower third of the tibia, and involving a much larger extent of bone. There was also a forward curve of both femora; there was no undue movement at the knee-joint. On March

8th, the left tibia was sawn partly through, about the centre of the gradual but extensive curve. The limb was fractured, and secured to an outside splint. On March 28th, the splint was removed. The leg was quite firm and perfectly straight. A piece of felt was moulded to the outer side of the leg, and fixed on by a gum-and-chalk bandage. This boy was readmitted on the 30th of May last, and the right limb was straightened by fracturing the tibia. He was discharged June 30th, 1879.

CASE V.—Jessie W., aged 6, was admitted May 30th, 1879. She was a strong, well nourished, healthy looking child, with both legs very much curved outward and forwards in the lower third. On June 14th, the right tibia was partially sawn through about an inch and a half above the ankle. When the bone was broken, the outward curvature was immediately corrected, but the anterior curve became more marked; this difficulty was, however, overcome by division of the tendo Achillis. The leg was fixed between side-splints. On June 19th, the leg was placed on a back-splint, and side-splints were applied. On July 6th, the leg was taken out of the splints. The limb was straight and firmly united. On July 12th, a similar operation was performed on the left leg. The same difficulty was encountered; and it was met in the same way.

CASE VI.—Alfred K., aged 6, was admitted February 7th, 1879. His family history was good. He had never been a strong boy. His legs had been growing forwards and outwards since he was two years old. The forward curve being very pronounced, it was deemed advisable to remove a wedge of bone from the tibia; the thicker portion of the wedge corresponding with the convexity in the bone. On February 15th, the operation was performed under the carbolic spray. An incision one inch in length was made along the subcutaneous surface of the left tibia in the long axis of the bone. The periosteum was then carefully separated from the bone by a crucial incision, a wedge-shaped piece of bone removed from that part of the tibia where the deformity was most manifest, and the leg placed in the straight position. The edges of the wound were approximated by wire sutures. The wound suppurated for a few days, but eventually healed soundly. The procedure adopted proved perfectly successful, and the boy was discharged with a straight left leg. This boy was readmitted on June 27th, and the right leg was subjected to the same treatment, with equally gratifying result. There has been but little suppurating from the second operation-wound, and that from the superficial parts only. The boy is still an inmate of the hospital.

These six cases belong to the first group; and as in three of them both legs were operated upon, we have in all nine osteotomies; simple subcutaneous division of bone in seven, removal of a wedge of bone in two.

In the second group, we have five cases, where the internal condyle of the femur was divided or otherwise operated upon to relieve the deformity usually known as "knock-knee".

CASE I.—Clara E., aged 7, was admitted September 18th, 1877. She was the subject of double genu valgum of an extreme kind. Other members of the same family were rickety. On October 24th, the internal condyle of the left femur was divided according to the plan known as Dr. Ogston's. The deformity was easily remedied after the separation of the condyles. On November 14th, the limb, which was found to be quite straight, was put up in a plaster-of-Paris bandage. On November 21st, the internal condyle of the right femur was divided. The result was equally satisfactory. This girl has presented herself on many occasions at the Children's Dispensary. Both legs maintain their corrected positions.

CASE II.—Edith H., aged 11, was admitted September 18th, 1877. Her legs began to give way seven months ago, without any very obvious cause, as her general health appeared to be quite good. The distortion of the left knee was very obvious, but it was not so much developed on the right side. A wedge-shaped piece of bone was removed from the left internal condyles. Although the operation was performed antiseptically, yet there was a good deal of suppurating afterwards. Eventually, however, the wound healed soundly, and the limb remains quite straight. Ogston's operation was performed on the right internal condyle. This patient was exhibited to the members of the Manchester Medical Society at the July meeting. It would be obviously very unfair to draw any conclusions from the observation of a single case; but the result of the operation on the left limb was entirely superior to that on the right.

CASE III.—Fanny V., aged 5, was admitted November 6th, 1877. Both knees were very much deformed; there was also much distortion of the tibiae and femora. The inbending of the knees had become much worse the last six months, and had now advanced so far as to make her quite unable to walk. On November 21st, osteotomy (Ogston's) of the internal condyle of the left femur was performed.

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† I am indebted to the Resident Medical Officers at the Children's Hospital for the particulars of these cases.