

ART. III.—*Observations on some practical Questions in Surgery:*

1. *On the Operation for tying the Subclavian Artery, internal to the Scaleni Muscles ;* 2. *Luxation of the great Toe upon the Dorsum of its Metatarsal Bone, which presented unexpected Difficulties in the Attempt at Reduction.* BY WILLIAM HARGRAVE, M. B., Professor of Surgery to the Royal College of Surgeons in Ireland, Surgeon to the City of Dublin Hospital.

I. ON THE OPERATION FOR TYING THE SUBCLAVIAN ARTERY INTERNAL TO THE SCALENI MUSCLES.

THE statistics for securing the right subclavian artery in the first part of its course, or internal to the scaleni muscles, afford a melancholy, and almost desponding history of this operation, as to its ever being successful. Every case on record (ten) of securing this vessel, has been a failure, whether performed in Great Britain, in Ireland, in the colonies, or elsewhere ; to all the same fatal termination—death, and all by the same fatality—hemorrhage. Are surgeons to abandon this operation in future (Liston says that it should never be again performed^(a))? or are they, in the spirit which should always actuate those engaged in our profession, to seek for the causes of failure? If these can be discovered, a way will then be opened which will lead with greater certainty to success.

The causes of the failure in this operation appear to me to be owing to the four following sources: 1st. To the anatomical position and relations of the vessel. 2nd. To the great disturbance, perhaps destruction, of the nutrition of the artery, caused by the difficulty of the operation. 3rd. To the tension of the artery after the ligature is tied. 4th. To the pathological conditions of the artery itself.

1st. As to the anatomy of the vessel and its relations, in-

(a) Liston's Surg., fourth ed., p. 200.

dependent of the intricacy of the latter, and the consequent difficulty in laying it bare, it differs in one respect from every other artery in the body which is required to be secured in its continuity, namely, after the artery is tied, it can be relaxed by position, which allows of great repose and a certain amount of quiescence, and so removes any strain caused by the ligature on it; this desideratum cannot be obtained for the subclavian, in consequence of the presence of the clavicle, which offers an insurmountable resistance to relaxing the artery after being secured. Place the extremity in any position, still no relaxation will follow, the consequence of which is that the vessel is kept in a state of tension, in all probability increased by the ligature.

2nd. The disturbance of the nutrition of the artery, perhaps its destruction, by which I indicate the injury inflicted upon its vasa vasorum, and the small quantity of cellular membrane in which it is imbedded; the often tedious proceeding—in many cases inevitable, to expose the artery with security to the important parts in the vicinity of which it is situated, destroying too many of the nutrient vessels, and thus depriving the artery of the sources from which the processes necessary for the effusion of plastic lymph and of adhesion are obtained. It is this injury inflicted upon the nutritious arteries of the vessel, which favours the occurrence of hemorrhage, and prevents the effusion of lymph where the ligature has been applied, which is corroborated by the condition of the vessel after death.

3rd. The increased tension of the artery should be always kept in mind. The effects of this cause are well established in Dr. Hayden's case, "The artery at the site of the ligature was gaping irregularly for three-fourths of its caliber, one-fourth sound and retaining the ligature;" and in Mr. O'Reilly's case "the divided extremities of the artery were patulous, and separated nearly two inches by coagula; their edges were jagged and irregular, and there seemed to have been not the slightest attempt at the reparative process;" the arteria innominata was

sound, and the heart natural. What reparation could have filled an arterial space of two inches?

4th. If the artery is diseased at the place where it is tied, failure is inevitable.

Such seem to me to be the causes which mainly act in rendering the operation, as hitherto performed, unsuccessful; can any of them be obviated? I incline to the opinion that the chief one can, namely, the impediment to a quiescent, if not an absolute state of repose for the artery, the want of which has been already pointed out.

It has been proposed, to facilitate the operation for securing the vessel in question, "to saw the clavicle"^(a), which would certainly afford more space for the subsequent dissections; this suggestion is borne out by performing the operation on the dead body: Cruveilhier has also advocated such a practice.

It is this step in the operation which I would again propose, not so much for the facile exposing of the artery, but to allow it to be gently relaxed, after having been secured, the section of the clavicle would allow this to be done by permitting the approximation of the shoulder to the trunk, and so remove any strain or tension that the ligature might cause on the vessel; it would also remain more imbedded in the surrounding cellular membrane, and receive its supply of blood more freely to assist in the sanatory processes consequent on the operation; while the movements of the upper extremity would produce but little, if any, disturbing effects upon the artery.

The mode of conducting the operation I propose would be, after the vessel was exposed and encircled in the ligature, carefully to saw through the clavicle about its middle, having previously guarded the subjacent parts with a spatula. If any alterations followed this step in the relations of the artery they would be of little consequence, it being noosed prior to the section of the bone; no delay or hinderance would then prevent

(a) Vide my *Operative Surgery*, p. 44.

the tying of the artery. The action of the muscles which draw the shoulder to the trunk, as the subclavius and pectoralis minor should then be aided by position, and the arm retained *in situ* by a bandage.

I have attentively sought for the published opinions on this proposal for sawing the clavicle, and can find but the following: in Velpeau's Operative Surgery he states, "that he can scarcely comprehend the reasons which M. Cruveilhier assigns as being useful to saw this bone, to tie the subclavian artery with more success"(a). The work referred to by Velpeau I have never seen, nor can I find it in the library of the Royal College of Surgeons, or in Trinity College.

This proceeding is spoken of in the following words by Dr Norris, of the Pennsylvanian Hospital, U. S., in a very valuable memoir on the mortality following the tying of the subclavian artery: "In cases of great difficulty of passing the ligature around the artery, it has been proposed by Mr. Hargrave and M. Cruveilhier to saw through or excise a portion of the clavicle,—a procedure, we should suppose, which would greatly tend to increase the difficulty of the operation"(b). It is evident from this quotation he refers to the operation for tying the artery in any part of its course. I confess that I am sceptical as to its adding to the "danger of the operation" in any part of its course, while I contend for the practice, especially as to the artery in the first part or its internal third.

The next authority which I can find is that of Dr. Flood, in his truly practical work on the arteries(c), who says, in referring to this proposal, after quoting the passage in all its details from my work, "they are entitled to the most serious consideration." Neither Velpeau nor Dr. Norris states explicitly their objections to this proposition.

Finally, in reference to the propriety of appealing to ope-

(a) *Etud. Anatom.* tom. ii. p. 609.

(b) *American Jour. of Med. Sci.*, No. xix., New Series.

(c) *Flood on the Arteries*, p. 88.

rative surgery for the relief of aneurism of the subclavian artery, owing to the fatality of securing the vessel in the first third of its course, it has been suggested to "amputate at the shoulder-joint, treating the stump in the ordinary manner, and keeping up steady and properly regulated pressure on the disease"(a).

In the two unsuccessful operations on this vessel, I quote these cases from Dr. Norris's paper, and consider that they were performed external to the scaleni muscles,—one by Sir A. Cooper, the other by Dupuytren. The former abandoned the operation, as he found it impossible to pass the ligature without including some of the brachial plexus; the latter, after an operation of one hour and forty-eight minutes' duration, succeeded, as he thought, in passing the ligature around the subclavian artery from above the clavicle. Pulsation continued in the tumour after the operation, and death took place on the ninth day, when the ligature was found loosely knotted on that portion of the fourth cervical which afterwards becomes the external cutaneous or musculo-spiral nerve. Dupuytren states that it was the most tedious, difficult, and painful operation that he had ever attempted. In these cases, had the clavicle been divided, the one would have been enabled to secure the vessel, the other also to effect this object, and not to mistake and tie a nerve in place of it.

In a medico-ethical consideration, the failure of operations in such hands as I have just quoted may be productive of unpleasant results; by which I intend to convey that failure by such practitioners might induce some surgeons rashly to undertake hazardous operations, when, if unsuccessful, they might console themselves and reconcile their want of skill by a reference to similar errors in the authorities now mentioned.

The object which should always be kept in view, and one of the fundamental principles of surgery, is to arrange its ope-

rations for their successful performance, not so much for the naturally skilful, but more for those who are not so gifted, who, by pursuing correct indications laid down for them, will be able, with only moderate dexterity, to perform their operations with present safety, and ultimate success to the patient.

II. LUXATION OF THE GREAT TOE OF THE LEFT FOOT ON THE DORSUM OF ITS METATARSAL BONE, WHICH PRESENTED UNEXPECTED DIFFICULTIES IN THE ATTEMPT AT REDUCTION.

Much as has been accomplished of late years by surgeons, both British and foreign, to render perfect our knowledge of the very important and frequent class of accidents termed dislocations, for which correct and accurate information is of such importance to the practitioner, that whatever can elucidate or afford more precise views of their nature and the impediments to their reduction, should induce every one to add his contribution to the profession for that object. Influenced by these feelings, I am desirous to record the following case, as presenting some peculiarities in the dislocation of the great toe on the dorsum of its metatarsal bone heretofore unnoticed, as far as my inquiries enable me to ascertain.

Charles Pike, a farm labourer, aged 23, was admitted into the City of Dublin Hospital November 27, 1846(a), suffering from luxation of the great toe of the left foot upon the dorsal aspect of the corresponding metatarsal bone, and with fracture of the fibula of the same side, a little above the malleolus. The accident was caused by direct violence, he having been thrown from a horse on the kerb-stone of a footway, the horse falling upon him.

Symptoms of the luxation were so evident as to be almost immediately detected; the riding of the great toe upon the

(a) This patient was admitted under Mr. Orr, and transferred to Dr. Williams; with their consent I publish it, the details of the case having been noted by Mr. T. D. Hargrave, L. R. C. S.

metatarsal bone; the prominence caused by it; the shortening of that section of the foot; not alone apparent, but rendered more so by comparison with the uninjured one; the motions most imperfect, indeed of no account: the plantar aspect of the ball of the toe was fuller than natural.

Reduction of this luxation was attempted by a well-applied lac on the toe, a good purchase being made on it, the foot having been previously well and firmly secured. The extending power was first made in the axis of the luxated bone, pressure, at the same time, being made on the phalangeal end of the toe which rested upon its metatarsal bone, and was so prominent as to afford a good fulcrum to act on. After persevering in the attempt for a reasonable time, and no success attending on it, the toe, still extended, was drawn to nearly a right angle with the foot, and pressure applied to its base, the two being then gradually brought to the horizontal position. This attempt also failed; further endeavours at reduction were then abandoned.

After the lapse of a few days reduction was again attempted, this time being aided by tenotomy of the extensor proprius pollicis pedis and internal tendon of the extensor digitorum brevis, also by the free division of the fibrous tissues on the internal surface of the joint, but no impression whatever was made in effecting it: the attempt was then finally abandoned.

In the interval which elapsed since the last attempt at reduction in December, an abscess formed in the ball of the toe, which burst, leaving a fistulous opening, and a fistula also formed at a corresponding point of the dorsum of the toe, through which latterly a probe could be passed so as to reach the bones, which felt denuded; likewise, when the toe was moved on the metatarsal bone, a grating sensation was felt: *the toe was in the flexed position.*

This patient now came under the care of Dr. Williams, and on February 24 he performed the following operation to remove the articular surfaces of the phalanx and metatarsal

bones: prior to it the patient was submitted to the influence of ether, and continued under its agency till it was completed. An incision was then made parallel to the inner edge of the foot, met by another at right angles, carried transversely outward over the line of the articulation. On dissecting away the integuments, the phalanx was found resting upon the superior and external part of the metatarsal bone, being firmly lodged in the interval between the first and second metatarsals. The capsular ligament did not seem opened on its anterior internal aspect, but a probe, passed into the superior fistulous opening, got into the joint, which was next opened from above.

Condition of the ends of the bones:—a small portion of the cartilage of the head of the metatarsal bone, on its superior aspect, was absorbed, equal to a split pea, without the presence of pus, while that portion of the bone on which the phalanx rested was soft and carious. The articular surface of the phalanx was covered with its cartilage, and appeared healthy; the sesamoid bones were also healthy, and fixed in their natural position. The articulating surface of the phalanx was then removed with a strong-bladed scissors, next the head of the metatarsal bone, including the carious portion already noticed, which, owing to its softness, was easily excised with the same instrument. The parts were then adjusted, the wound cleansed, dressed simply, and the patient carried to his bed.

Nothing worthy of note occurred in the healing of the wound, and, on the 10th of April he was permitted to leave his bed and walk about the ward, supported by crutches, but not to bear upon the toe. On the 7th of May succeeding he was discharged from the hospital in the following condition: he possessed the power of *extension* and of flexion of the toe; he could bear his weight firmly on the posterior part of the foot, but did not venture on the ball of the toe.

I have had many opportunities of hearing of the progress of this very valuable case since he left the hospital, and am in-

formed that he has completely regained the use of his foot and toe, and is fully able to perform all his duties as an active farm servant.

This luxation presents many points of analogy with that of the first phalanx of the thumb on the dorsum of its metacarpal bone. First, as to the anatomical relations, the articulating heads of the metacarpal and tarsal bones are both very large, each possessing a more or less well-formed neck ; each is furnished with two well-marked and fully developed sesamoid bones, into which a number of powerful muscles are inserted. Into the sesamoids of the metatarsal bone, the internal one has attached to it the abductor pollicis pedis and the inner tendon of the flexor brevis pollicis pedis ; the external one has, inserted into it, the external tendon of the flexor brevis, the adductor pollicis pedis, and a portion of the transversus pedis: the lateral ligaments of the articulation are strong and firm, while the capsular one is particularly so on its plantar aspect. The analogy between these two articulations is still carried out in reference to the articulating surface of the first phalanx of the toe, which presents a very superficial cavity, having but a small proportion to that of the corresponding head upon which it moves ; and very strong muscles inserted into it, viz., the internal tendon of the extensor pollicis brevis, and the tendon of the extensor proprius pollicis pedis. On the inferior surface of the last phalanx the tendon of that very powerful muscle, the flexor longus, strengthened by its connexion with the flexor digitorum longus communis is inserted into it, while to the internal surface of the first phalanx the abductor pollicis pedis is attached. Taking the two bones constituting the toe, we have four muscles attached to them, three of which are very powerful,—the proper extensor of the great toe, the long flexor of the great toe, and the abductor.

What was it that opposed the reduction in this case? Nothing but muscular agency, as already indicated. A sufficient purchase was had by the lac, so carefully applied as would have

enabled the phalanx to be torn from the foot, if required. By tenotomy the extensor tendons were divided, and, I would also say, the abductor pollicis pedis; still reduction could not be accomplished. As far as muscular opposition was further concerned in this luxation, we must look principally, if not solely, to the long flexor, and its connexion with the flexor longus digitorum pedis, which prevented the removal of the phalanx from the abnormal position into which it was forced by the accident. It may be asked, what would the section of the first-named tendon have effected?

One pathological fact, of great value, has been derived from this case, namely, the perfect restoration of the extensor muscles to their proper functions over the phalanges of the toes, after what may be considered a double operation,—the first being that of tenotomy,—the second, the excision of a portion of the phalanx of the toe with the head of the metatarsal bone. This reparation took place in a comparatively short period,—three months; also a healthy false articulation was formed, compensating for the natural one.

If this luxation had been left to the sole efforts of the system, to take its own course, would the results have been as favourable, and so quickly accomplished? I think not; as, from the position of the phalanx, lodged upon and between the two internal metatarsal bones, the same kind of deformity would have permanently followed, which is represented as affecting the metacarpo-phalangeal articulation of the thumb in a paper by Mr. Adams in the *Cyclopædia of Anatomy*, obtained from me. What should be the line of practice in such a luxation? is a question more easily asked than satisfactorily answered. If tenotomy is resorted to, it should include the section of the long flexor of the great toe, and then to attempt the reduction.

I have been able to obtain scarcely any information on this particular accident from any published works: no example in Cooper on Dislocations and Fractures, who, in speaking of dislocation of the toes from the metatarsal bones, says it is a

very uncommon accident. Dupuytren(a) is altogether silent on it. Delpech describes this luxation in the following terms, which I transcribe from his work: he says that "the great toe has been luxated on the first metatarsal bone and carried to its external side, while the soft parts on the internal side of the articulation have been lacerated, from which results a considerable projection of the metatarsal bone and the impossibility to reduce the luxation; the denuded bone was disarticulated and removed in totality; the contraction of the muscles drew back the first toe, but not sufficiently far to bring it into contact with the first cuneiform, so much so that this member was useless and without motion, for want of a '*point d'appui*,' and the too great laxity of the muscles. We think that in a similar case it would be better to make the resection of the denuded metatarsal, and to procure ankylosis with the great toe"(b). This is evidently a compound luxation; the practice recommended is good, but would fail in effecting ankylosis.

Boyer says the possibility of luxation of the first phalanx of the great toe from the first bone of the metatarsus may be easily conceived. It is not necessary to give here the rules to be followed in such a case; they consist in reducing the luxation and amputating the great toe, when the state of the soft parts renders it impossible to preserve it(c). Another example of a compound luxation.—Liston mentions a case of a compound luxation of the distal extremity of the metatarsal bone of the great toe, which was broken; "the broken head of the bone was removed," the patient recovered with the perfect use of his foot(d).

In cases of failure of the reduction of this luxation, "the

(a) Dis. and Surg. of Bones, published by the Sydenham Society.

(b) Delpech, *Precis Elementaire des Maladies réputées Chirurg.*, tom. ii. p. 141.

(c) Boyer on the Bones, translated by Mr. Farrell, vol. ii. p. 205.

(d) Liston's Surgery, p. 137.

projecting end is recommended to be sawn off, and the bone kept in its proper place by a suitable apparatus"(a).

From such researches it is evident that the rarity of this accident must be very great, and fully justifies it being brought before the profession. In cases of difficulty and failure in the reduction, the surgeon will either have to perform tenotomy of all the tendons of the toe, which is a simple and comparatively painless operation, even without an anæsthetic agent: or to perform a more compound one, the section of the projecting end of the bone, and then reduce it, and maintain the parts *in situ* by proper bandaging and apparatus. From the success attendant upon Liston's case, also from the one now submitted to the profession, perhaps it would be the most satisfactory practice to have immediate recourse to resection of the bone, after the attempts at reduction had failed, and follow up the treatment so as to obtain a false but useful articulation.

ART. IV.—*Report upon the recent Epidemic Fever in Ireland.*

IN the hope of preserving some record of the late disastrous epidemic which devastated this country during the years 1847 and 1848 in particular, the Editor of this Journal addressed a circular to those medical practitioners throughout the kingdom from whom he thought it likely he should obtain the desired information. The list of questions contained in the circular, together with the accompanying letter, which will be found in the note on the opposite page, will best explain the nature and amount of the information sought for.

To this circular more than seventy answers have been received, being in some instances extensive reports, and in others satisfactory replies of shorter extent.

(a) Chelius, translated by South, vol. i. p. 814.