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Contributors

Carden, Henry Douglas, -1872.
Royal College of Surgeons of England

Publication/Creation

London : T. Richards, 1864.

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ON

AMPUTATION BY SINGLE FLAP.

BY

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*[Read before the Birmingham and Midland Counties Branch of the British
Medical Association.]*

LONDON :

T. RICHARDS, 37, GREAT QUEEN STREET.

1864.

[*Reprinted from the* BRITISH MEDICAL JOURNAL.]

AMPUTATION BY SINGLE FLAP.

THE object of the present essay is to bring before the profession the practical results of a plan of operating in amputation of the thigh adopted by me in 1846, as shown in a series of thirty-one cases occurring in my practice during eleven years from that period; and which I have called amputation by single flap, or, more precisely, single skin-flap; and, at the same time, to state my reasons for adopting this method in preference to any other.

Every surgeon who has had much experience as a dresser, must be familiar with the difficulties that especially beset him in dressing patients after amputations of the thigh; nor will he readily forget the anxious time he has passed in taking charge of a painful and twitching stump, looking out for secondary hæmorrhage, or his subsequent task of having to deal with profuse suppuration, unmanageable or insufficient integument, retreating muscles, and obtrusive bone; and how he inwardly purposed to avoid all

this in future, if he should haply succeed to wield the knife himself.

Under these impressions, I commenced hospital practice in 1838; when chloroform, the handmaid of conservative surgery, was unknown, and when celerity of execution was the order of the day; when we were taught to stab the limb with Lisfranc's long knife, and, having made two cuts outward with the rapidity of lightning, and sawn the bone with breathless haste, to consign the severed limb to the sawdust in less than sixty seconds.

I adopted these somewhat theatrical performances at that time, operating by the watch as others did; and, I believe, with about the same amount of satisfaction and success. Occasionally, however, shattered limbs presented themselves, which did not admit of such rapid manœuvres. There were two cases in particular, where the accident had left nothing but cold and flimsy shreds of skin to cover the shoulder-joint and exposed acromion in one case, and the tibia and fibula in the other; and I was driven to the necessity of shaping and economising them as best I could; and the result of these two cases is not without significance.

In 1845, my attention was drawn to a few of my old cases of amputation; and I was much struck by the fact that, where double muscular flaps had been employed to cover the end of bone, the cicatrix had been drawn gradually over the sawn part, render-

ing the stump incapable of bearing the least pressure ; whereas, in the two cases referred to, the flaps were plump and painless, and capable of bearing very considerable pressure on the end without flinching.

Under these circumstances, I determined to try the method of amputation by a single flap of skin ; and I have been so well satisfied with the results, that I have never since that time used any other.

The operation consists in reflecting a rounded or semioval flap of skin and fat from the front of the joint (Figs. 1 and 2) ; dividing everything else straight



Fig. 1.—Line of Incision.

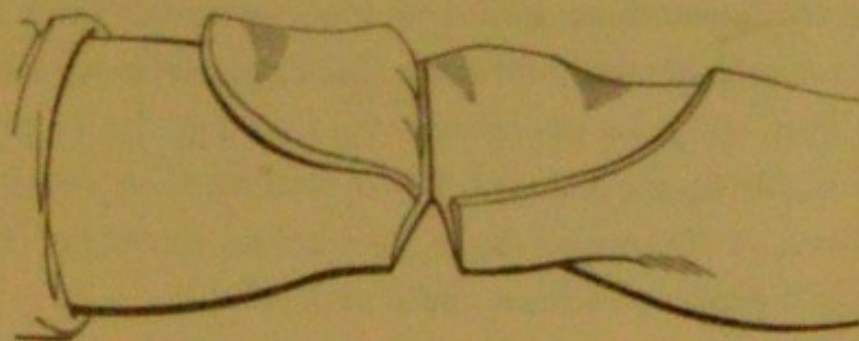


Fig. 2.—Flap Reflected.

down to the bone ; and sawing the bone slightly above the plane of the muscles ; thus forming a flat-faced stump with a bonnet of integument to fall over it. (Figs. 3 and 4.)

The operation is simple ; and is performed easily in two ways.

The operator, standing on the right side of the limb, seizes it between his left forefinger and thumb at the spots selected for the base of the flap, and enters the point of the knife close to his finger, bringing it round through skin and fat below the patella to the spot pressed by his thumb ; then, turning the edge downwards at a right angle with the line of the limb, he passes it through to the spot where it first entered, cutting outwards through everything behind the bone. The flap is then reflected, and the remainder of the soft parts divided straight down to the bone ; the muscles are then slightly cleared upwards, and the saw is applied.

Or, the limb being held as before, the hand and knife may be brought round under the limb, as in the circular operation, and the blade entered near the thumb and drawn round to the opposite side, when the ham may be cut across by turning the edge of the knife upwards, and the operation completed as before. This requires rather more dexterity and flexibility of wrist than the first method.

Or the flap may be reflected first, and the knee examined, particularly if the operator be undetermined

between resection and amputation. In amputating through the condyles, the patella is drawn down by flexing the knee to a right angle before dividing the soft parts in front of the bone; or if that be inconvenient the patella may be reflected downwards.

In this operation, the arteries are easily found and secured, without loosening their tourniquet; but there is a point worth noticing whilst tying the popliteal artery in this situation; namely, its close proximity to the vein, and the tendency to secondary hæmorrhage from the vein in consequence. This occurred to such an extent in two of the early cases, that I had to re-open the dressings, and found the closure of the vein prevented by the stroke of the artery. This was immediately checked, and afterwards always prevented, by gently separating the vessels for an inch upwards. The flap falls easily over the end of the bone (Fig. 3); and, when united to the posterior integuments

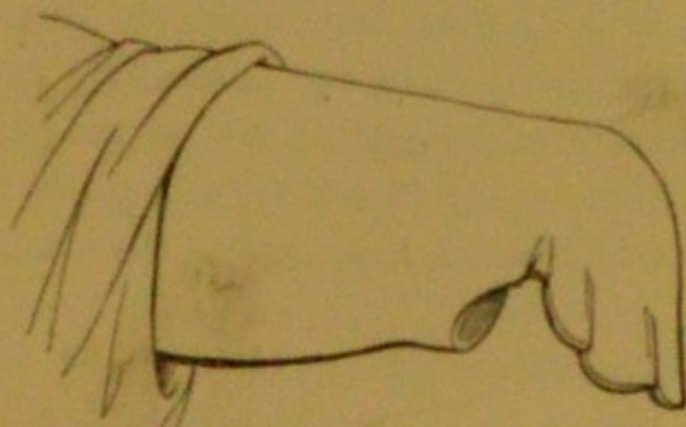


Fig. 3.—Flap falling over end of Bone.

by a few pins or sutures, is drawn strongly upwards and backwards by the greatly retracted flexors, and has a somewhat puckered and redundant appearance at first, as shewn in Fig. 4. This is no disadvantage.



Fig. 4.—Flap covering Stump: Sutures applied.

The dressing may be of the lightest and simplest kind; a few strips of soap-plaster between the sutures, and a light bandage perhaps. I have often been content to use a cap of soft porous linen, drawn over the end of the stump, and secured above by a broad circular strip of plaster. Whatever dressing be used, it is of great importance to loosen it and examine the stump early, and to carefully provide for the free escape of serum.* I remove the pins or sutures at from twenty-four to forty hours at furthest, and never find that I have opened the dressings too soon.

The principal advantages obtained by this plan

* I lay the more stress on this point from the first, as Mr. Fergusson, in his work *On Surgery* (page 134), is liable to be misunderstood.

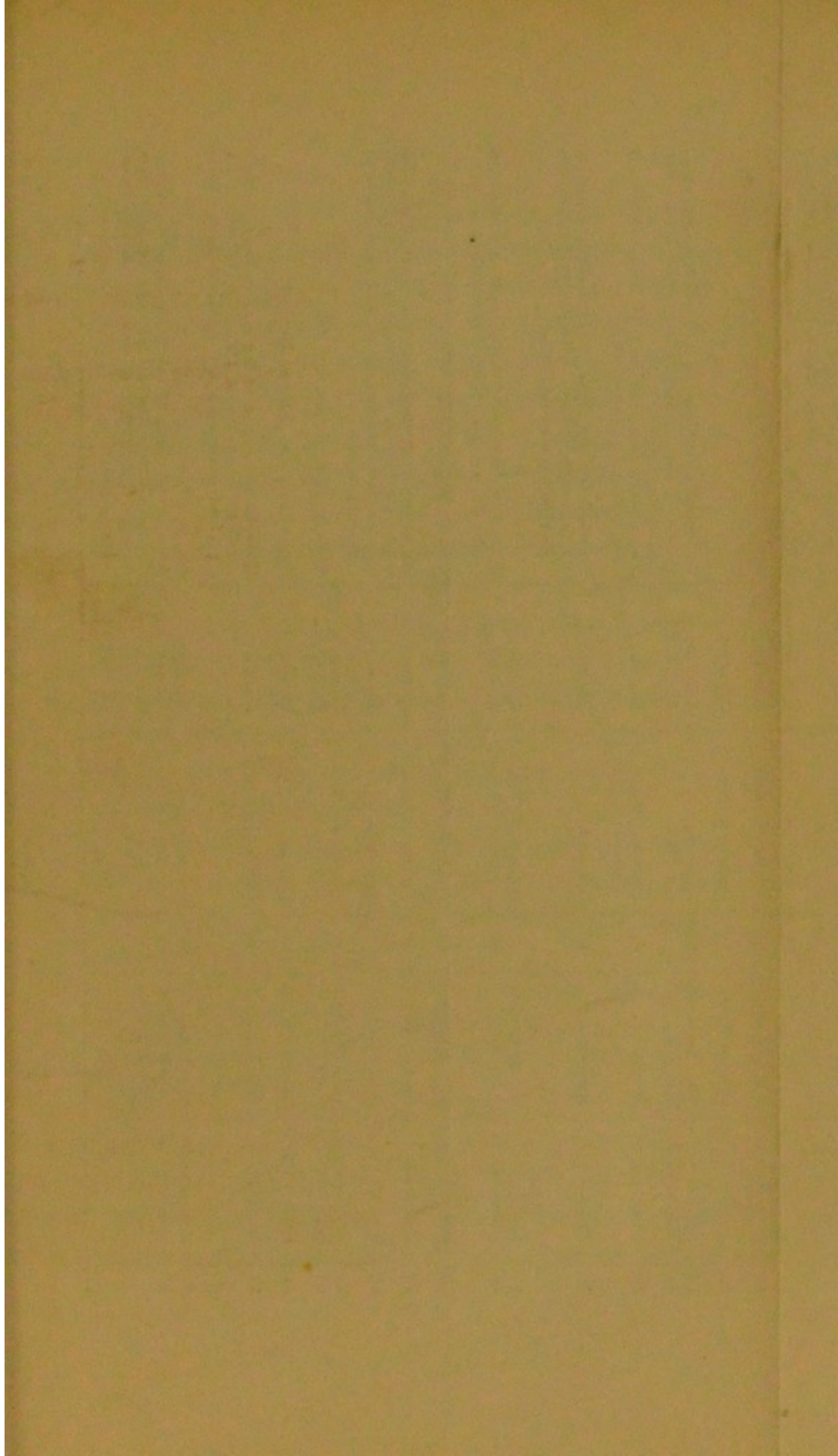


TABLE I.—*Amputations at the Thigh by Single Skin Flap, performed by Mr. Carden from July 1846, to December 1856.*

No.	Date.	Name.	Age.	Disease or Accident.	Result.	Remarks.
1	1846. July 14.	James George.	32	Disease of knee.	Recovery.	Hemorrhage from vein. Fig. 10.
2	October 12.	Charles Good.		Disease of knee.	Recovery.	Hemorrhage from vein. Fig. 11.
3	November 18.	Mr. Goddall.	45	Disease (cancer) of tibia.	Death.	Advanced encephaloid of head from hæmaturia, Dec. 14th. Stump healing favourably.
4	1847. April 6.	James Jones.	20	Disease of knee.	Recovery.	Bears his weight on the end of stump; uses peg-leg, 1863. Fig. 9.
5	April 15.	Saml. Walker.	49	Disease of knee.	Recovery.	Whole weight borne on the end; walks thirty miles a day. Figs. 7 and 8.
6	April 15.	Joseph Stanton.	19	Disease of knee.	Recovery.	Old diseased tibia after burn, assuming malignant character.
7	July 6.	Mary Bourne.	40	Disease (cancer) of tibia.	Recovery.	Amputation through ankylosed joint. Old fractured patella. Figs. 5 and 6.
8	August 19.	Wm. Jackson.	24	Disease of knee.	Recovery.	Under treatment nine years; great pain and emaciation; bears full weight, 1863.
9	October 15.	Abel Vine.	36	Disease of knee.	Recovery.	Bore very firm pressure on the end in a fortnight.
10	1848. February 19.	James Bridges.	11	Disease of knee.	Recovery.	Bore half his weight before leaving.
11	1849. June 25.	Wm. Cooper.	22	Disease of knee.	Recovery.	Advanced encephaloid of femur. (Museum.) Amputation at upper third. Discharged cured on July 21. Disease returned in liver two years afterwards.
12	June 4.	Caroline Jeffs.	19	Disease (cancer) of femur.	Recovery.	
13	August 30.	Ann Jones.		Disease of knee.	Recovery.	
14	November 9.	Wm. Coborn.	30	Disease of knee.	Recovery.	
15	1850. August 29.	Charles Hook.	14	Disease of tibia.	Recovery.	
16	1851. April 8.	Wm. Andrews.	30-30	Accident.	Recovery.	Leg smashed into knee-joint. Primary amputation.
17	November 8.	Wm. Hill.	18-25	Accident.	Recovery.	Extensive laceration extending into joint. Primary amputation.
18	December 19.	John Finn.	21	Disease (cancer) of tibia.	Death.	Encephaloid disease of head of tibia. Died from exhaustion on January 15.
19	1852. May 12.	Maria Lea.	46	Accident.	Death.	Smashed leg and knee. Extensive contusions. Primary amputation. Died in twenty-four hours. No reaction after accident.
20						
21	1853. July 23.	Elizth. Bishop.		Disease of knee.	Recovery.	Compound fracture of right leg, with fracture of left; contusions. Secondary amputation.
22	December 24.	John Watts.	28	Accident (railway).	Recovery.	
23	1854. February 26.	Wm. Ashton.	15	Accident (machine).	Recovery.	Primary amputation.
24	1855. March 12.	Captain H.	40	Disease of knee.	Recovery.	Extensive suppurations of knee-joint and thigh. Old fractured patella. Slow recovery. Figs. 12 and 13.
25	May 12.	Wm. Stone.		Accident.	Recovery.	Severe contusion of pelvis and abdomen. Secondary amputation.
26	September 20.	John Weaver.	35	Disease of knee.	Recovery.	Secondary amputation.
27	September 29.	Mary Ely.	20	Accident.	Recovery.	
28	1853. February 26.	Joseph Liddell.	50	Disease.	Death.	Acute gangrene. Died on March 7.
29	1856. March 20.	Wm. Insull.	48	Disease (cancer).	Death.	Encephaloid cancer of leg and knee, advanced. Admitted on March 19th. Exhausted from profuse hemorrhages. Died on April 14th.
30	November 15.	Mary Jackson.	30	Disease of leg.	Recovery.	Fig. 14.
31	December 24.	Ann Trenfield.	53	Disease of knee.	Recovery.	Had severe attack of erysipelas, after secondary hemorrhage. Disease supposed to be malignant. Amputation at the middle of femur. Figs. 15 and 16.

appear to me to be the following:—the facility afforded for amputating, either through the knee or through any part of the lower end of the femur; thus proportionately avoiding the shock of higher amputation, and the risks of exfoliation, pyæmia, etc., attendant on sawing through the cylinder of the bone; the simplicity of the whole proceeding, and small extent of the wound; the favourable position of the flap for dressing and for the escape of discharge; painlessness and quietude of the stump, the principal nerves being divided high up and drawn out of reach of pressure or exposure; the fitness of the stump to stand and walk upon; the bearing being broad, and the skin employed being accustomed to bear the weight of the body in kneeling; the cicatrix being drawn clear of the point of the bone, out of the reach of pressure.

The rate of mortality is very favourable as far as the numbers go; as will appear by an examination of the accompanying summary of the table of thirty-one cases. (See Table I.)

	Deaths.	Recoveries.
Primary, for accidents 4	1	3
Secondary, do. 3	0	3
Advanced cancer 6	3	3
Sloughing gangrene 1	1	0
Disease 17	0	17
	—	—
Total 31	5	26
	—	—

Of the deaths, the largest number was 3 in 6 from cancer. Of these, Godsall, (No. 3), aged 45, died of

hæmaturia in twenty-six days ; the stump was healing. John Finn (No. 19), aged 20, with advanced encephaloid, died exhausted in twenty-six days. And William Insull (No. 29), aged 48, died in eighteen days, exhausted by previous repeated hæmorrhages.

Of primary amputations for accident, 1 in 4 died ; namely, Maria Lea (No. 20), aged 46, with smashed leg and knee and extensive contusions ; she died in twenty-four hours ; there was no reaction. (The recoveries were healthy young men, and a boy aged 15.)

There was one death from sloughing gangrene ; viz., Jos. Liddell (No 28), aged fifty ; death in nine days.

Of secondary amputations for accidents, 3 in number, all recovered ; viz., Nos. 22, 25, 27—two railway guards, and Mary Ely, aged 20.

Of amputations for disease, 17, all recovered ; the ages were from 11 to 53 ; 13 were males, and 4 females.

Of the 26 recoveries, sketches and photographs of some cases will fairly illustrate the average character of the stumps at different lengths of bone from the knee-joint to the middle of the shaft, at periods after amputation, varying from six weeks to eleven years ; and one has been especially selected as the worst stump, taken about three years after amputation.

CASE I (No. 8). Wm. Jackson, aged 24, was admitted into Worcester Infirmary July 24th, 1847, with soft anchylosis of the knee. He had been in the Gloucester Infirmary a year and a half previously, for fractured patella. He went out, and walked too soon. Inflammation and abscess followed; the joint was left to take its chance. On admission, the joint was bent and anchylosed at an acute angle (Fig. 5);



Fig. 5.—Wm. Jackson. Position of Leg and Lines of Incision.

the front of the tibia was adherent to the posterior surface of the condyles. The fragments of the patella were separated to the utmost. The joint was intensely painful; the slightest movement was insufferable.

August 19th. Amputation was performed through the joint. The flap (Fig. 5) was reflected from the anterior tuberosity of the tibia upwards, sufficiently high to admit the knife through the joint down to the adherent bones. The muscles and tendons in the ham were divided, when the bony adhesions gave



Fig. 6.—Wm. Jackson, after Amputation.

way. The rough surfaces were smoothed down ; and the skin came together easily, and healed in twelve days (Fig. 6). In September, he could bear his weight on a padded seat, before he left the hospital.

CASE II. The next in length is from Joseph Stanton (No. 6), whose leg was amputated on April

15th, 1857. Fig. 7 represents the stump six weeks



Fig. 7.—Joseph Stanton. Stump six weeks after Amputation.
after amputation. Fig. 8 represents it eleven years



Fig. 8.—Joseph Stanton. Stump eleven years after Amputation.

afterwards. He walks very long distances, bearing on the end.

CASE III. James Jones, aged 20 (No. 4, Fig. 9)



Fig. 9.—James Jones. Stump six weeks after Amputation.

had his leg removed one inch and a half above the condyles. He can walk fifteen or twenty miles a day, bearing on the end, with a common wooden leg. (1863.)

CASE IV. James George, aged 32 (No. 1). Amputation was performed July 14th, 1846, two and a half inches above the end of the femur (Fig. 10). He bears nearly his weight on the end.

CASE V. Charles Good (No. 2, Fig. 11). The stump

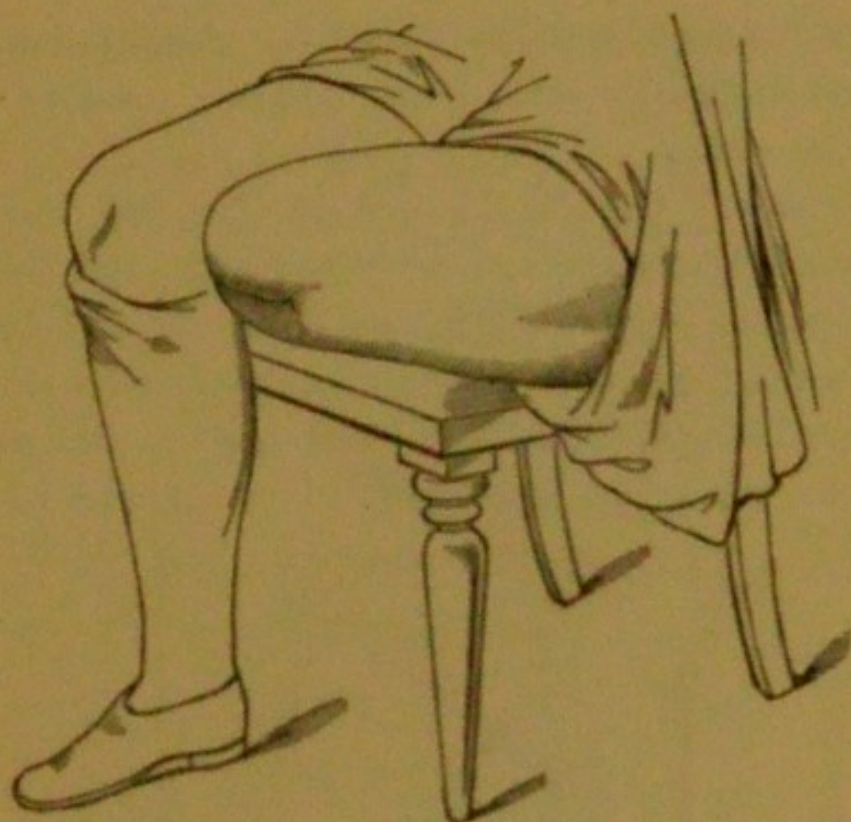


Fig. 10.—James George.



Fig. 11.—Charles Good. Stump three months after Amputation.

is of the same length as in Case iv. Amputation was done on October 12th, 1846. He bore pressure well in six weeks.

CASE VI. Captain H., aged 40 (No. 24), had old pulmonary disease, and was much worn and wasted by profuse suppuration in the knee-joint and extensive abscesses of the thigh. Amputation was performed March 12th, 1855. The case was protracted. There was slight exfoliation. Figs. 12 and 13 are

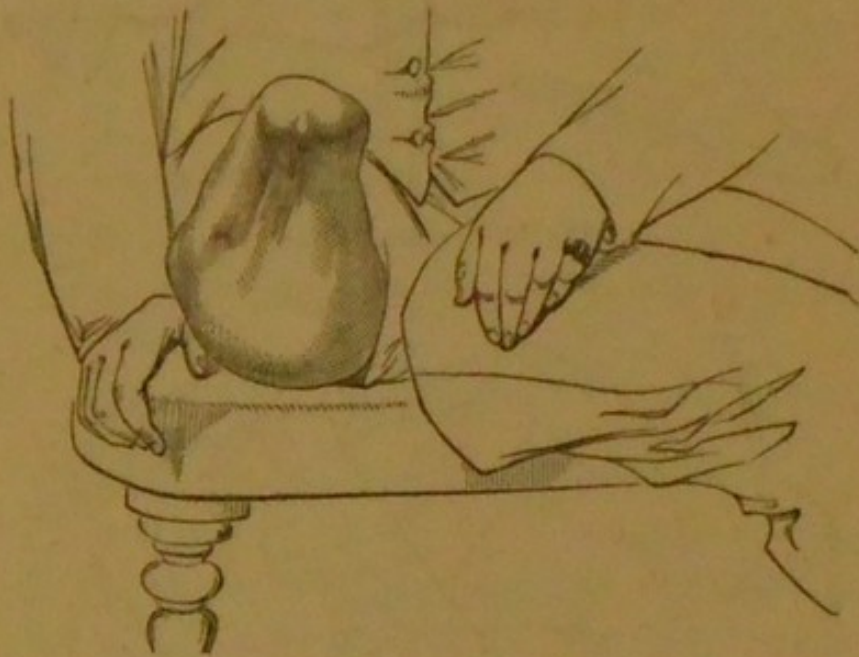


Fig. 12.—Captain H. Stump three years after Amputation.

from photographs taken in 1858, when more than half the weight was borne on the end with Gray's artificial leg. This worst stump was much praised by Mr. Gray for its capability to bear weight.



Fig. 13.—Captain H. Stump three years after Amputation.

CASE VIII. Mary Jackson, aged 30 (No. 30), had amputation of the left thigh performed two and a



Fig. 14.—Mary Jackson.

half inches above the condyle. She walks well on a wooden leg made by her husband, bearing on the end (Fig. 14.)

CASE IX. Ann Trenfield, aged 53, December 24th



Fig. 15.—Ann Trenfield.

(No. 31). Amputation was performed through the middle of the shaft. She had secondary hæmor-

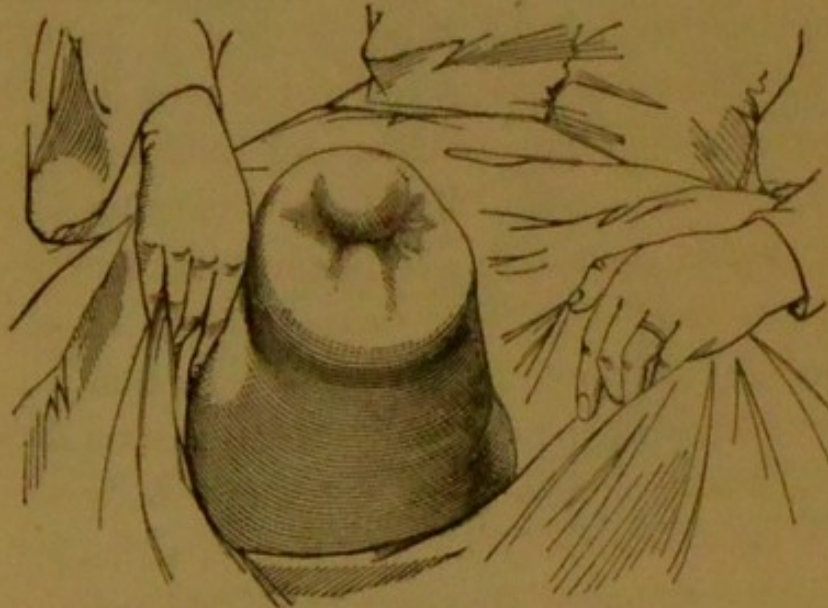


Fig. 16.—Ann Trenfield.

rhage and erysipelas. She can bear pressure well on the end, but had not walked when the photograph was taken. (Figs. 15 and 16.)

With the exception of No. 12 through the upper third, for encephaloid disease of the femur, the remaining eighteen cases of recovery were amputations at the lower end of the thigh bone, and corresponded in their capability of bearing weight on the end. In none was there any loss of skin from sloughing, although the skin in many cases was pale and puffy, frequently scarred with issues and other appliances, and occasionally perforated by sinuses. One of the most striking features in these cases is the remarkable thickening which the skin speedily undergoes, and the brawny firmness it afterwards acquires, when exposed to graduated pressure.

Having been frequently urged, by friends who had witnessed the results of my method, to publish the foregoing cases, I had prepared the table in 1858, accompanied by the sketches and photographs, with that intention, when Mr. Teale's valuable work on *Amputation* appeared, and seemed to me, at first sight, to render anything further on the subject unnecessary on my part. Mr. Teale's method of operating with a long and a short rectangular flap appears to provide an excellent stump to walk upon, when the materials for forming it are attainable. The evidence of Messrs. Grossmith and Heather Bigg is

conclusive as to the great superiority of Mr. Teale's operation in this respect over the double flap and circular plans. His rate of mortality, also, is greatly in favour of his plan, compared with the usual methods. It appears to me, however, that an eight-inch muscular flap is not always to be had, with due regard to the essential principle of removing the point of severance as far as possible from the trunk. (Erichsen's *Science and Art of Surgery*, second edition, page 20, lines 33, 34). The extent of wound is certainly great, being thirty-two inches in a circumference of sixteen; whilst the divisions of muscles longitudinally for eight inches can scarcely be accomplished at all times without risk of bad consequences, particularly by surgeons less skilful than Mr. Teale.

Mr. Lister's observations on Teale's method, in his essay on Amputation in the third volume of Holmes's *System of Surgery*, lately published, bear so directly on the subject of this paper, that I may be allowed to quote his opinion. He says, page 162: "Thus, in a particular instance, where the development was by no means extraordinary, the dimensions were such that, supposing the anterior transverse incision made at the level of the upper border of the patella, it would have been necessary, in order to preserve Mr. Teale's proportions, to saw the bone eleven inches further up, or full five inches higher than if the modified circular operation were performed. This must,

cæteris paribus, very seriously increase the risk, which is always greater the nearer the seat of amputation is to the trunk. The cut surface is also very extensive; and this would give rise to a correspondingly large amount of suppuration, if immediate union failed. It therefore becomes an important question, whether the advantages of Mr. Teale's plan may not be obtained in some less objectionable manner."

He then proceeds to propose a modification by an anterior flap of six inches in front, without any posterior flap at all, retracting the muscles two inches before dividing the bone; and observes: "That such a procedure would answer well is not, however, a mere matter of inference; for, since the appearance of Mr. Teale's work, Mr. Spence of Edinburgh has performed some amputations of the thigh according to his directions, and others by cutting from without inwards a large rounded anterior flap, dividing the posterior parts at the level of its base by a perpendicular sweep of the knife, and retracting the muscles before applying the saw. I have had the opportunity of comparing the fulness of the cushion in both cases; and Mr. Spence tells me that, where it has been formed after the latter mode, it has proved capable of bearing a large proportion of the weight of the body.

"Still, this proceeding would involve as high a division of the bone as Mr. Teale's, if the anterior flap had the length above mentioned: and the ques-

tion yet remains, whether it may not be curtailed, and eked out with a short posterior flap, without impairing the usefulness of the stump. Provided the covering of the bone be sufficiently full, the essential thing to be attained is, that the tender cicatrix shall be so placed as to be free from any chance of being squeezed between the bone and the bottom of the socket of the limb. Now, it fortunately happens . . . that the bone lies forward among the muscles, so that even its posterior surface is considerably anterior in position to the longitudinal axis of the limb. Hence a flap half the diameter of the limb would more than cover the bone ; and one as long as two-thirds of that diameter would ensure the scar being considerably behind the point of pressure ; especially as the absence of the two inches of bone above the base of the flap would allow it to drop lower than it otherwise would. Also, in the further progress of the case, the contraction of the muscles will draw the cicatrix still further back ; an effect long since noticed by Alanson" "after his circular operation."

Mr. Lister then proposes that, "in order to compensate for the diminution of the anterior flap, a posterior one must be made of rather more than half its length, and of rounded shape, for adaptation to it ; and the integument of this flap should be dissected up before the posterior muscles are divided, so as to set it free from the effects of their contraction. On the other hand, the anterior flap, after being

marked out by carrying the knife through the skin and fat, should be raised so as to contain a good deal of muscle, which will be useful, both by insuring the vitality of the rather long flap, and also by increasing the thickness of the cushion below the bone; while any tendency to contraction that it possesses (small compared with that of the posterior muscles) will be counteracted by the force of gravity, through which it will naturally tend to occupy its proper place."

"By this mode of amputating, the bone will be divided about as low as in the modified circular operation; and, though I have not yet had much opportunity of trying it on the living subject, I feel satisfied from the above considerations, and from experiments on the dead body, that it will attain the essential objects of Mr. Teale's plan, while it will occupy less time than either of the methods alluded to. The flaps, when brought together, will be free from tension; and the stump, if properly dressed, most favourably circumstanced for safe and speedy healing."

In his observations on dressing, Mr. Lister lays great stress on providing a free escape for serum. This, I can say from experience, is a most important point, and one that cannot be too strongly urged.

It will be obvious from the above extract, that Mr. Lister still considers that no plan hitherto adopted

has fulfilled the requisite conditions in amputations of the thigh; namely, that of obtaining a long and useful stump in this situation by a sufficiently safe and simple operation.

The foregoing table of thirty-one cases, performed with the definite object of testing the application of a particular principle to amputation of the thigh, will, I venture to hope, not be without its use, if it can be proved, on a more extended scale, that skin and fat only, when placed properly over the end of a sawn bone, is quite equal, with a little attention to graduating the pressure at first, to sustain the weight of the body. When we find all the bony prominences and resting-points of the body and limbs covered only with skin and fat, why should not the broad ends of the femur and tibia be sufficiently protected by the same hardy covering? Having already tested its capabilities in amputations of every part of the extremities (except the hip-joint) for the last eighteen years, I feel great confidence in recommending its adoption, or at least a trial, on the part of the profession generally.

Mr. Sheppard has kindly favoured me with a record of cases kept by him of thirty-two amputations on this principle at the Worcester Infirmary, from June 1859 to the end of 1863, performed by himself, Mr. Budd, Mr. Walsh, and myself, with a mortality of seven in thirty-two. These numbers are not suffi-

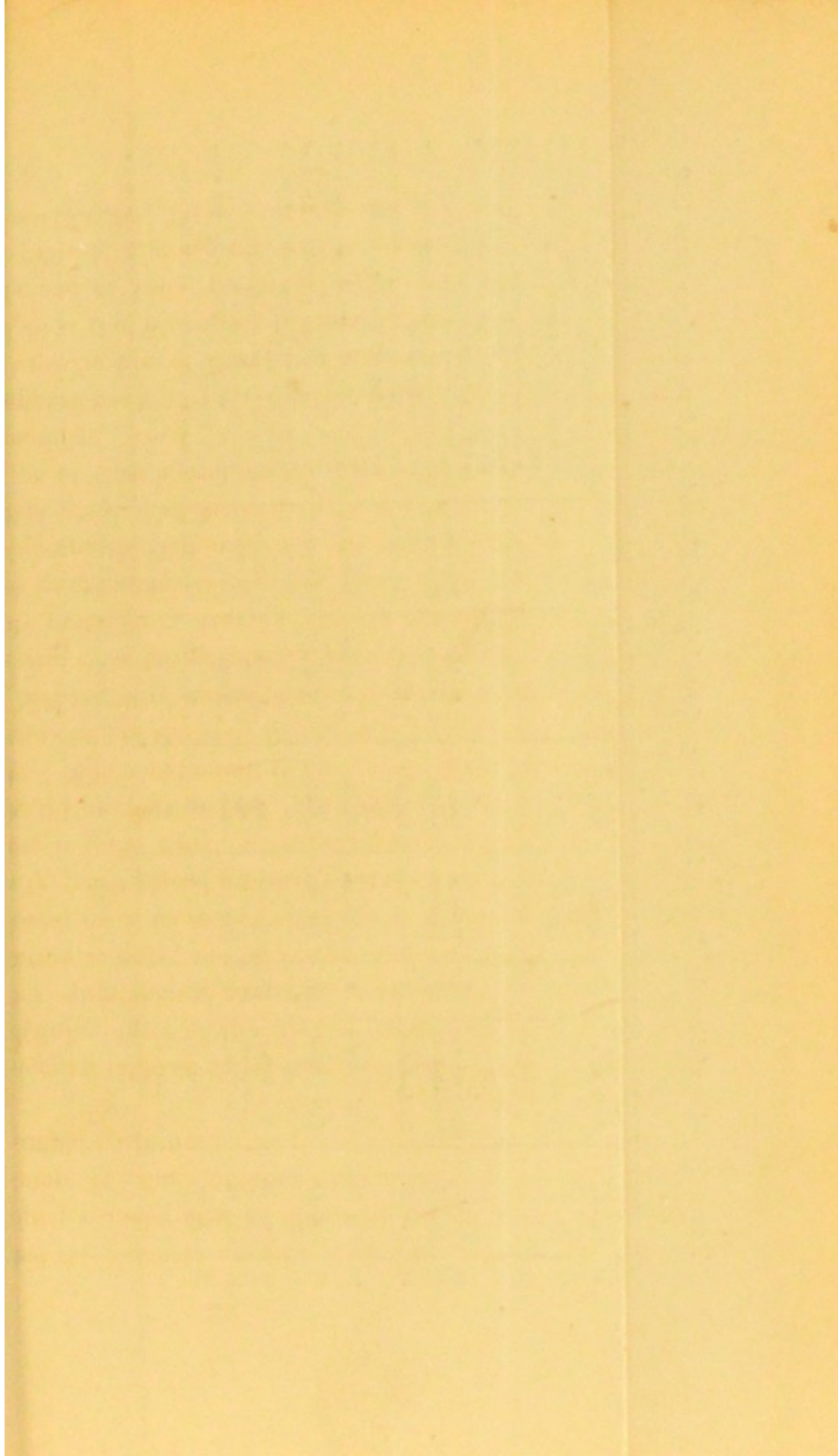


TABLE II.—Amputations by Single Skin Flap, performed in the Worcester Infirmary, from June 1859 to December 1863.

No.	Date.	Name.	Age.	Accident or Disease.	Part amputated.	Operator.	Result.	Remarks.
1	1859. June 14.	Wm. Taylor.	61	Disease.	Forearm.	Mr. Carden.	Recovered.	Skin flaps. Muscles divided circularly.
2	June 20.	Thos. Carter.	44	Disease.	Forearm.	" Budd.	Recovered.	Nine days before admission wounded the thumb. Inflammation and abscesses followed, which rendered amputation necessary.
3	July 27.	Adam Keller.	40	Accident.	Forearm.	" Sheppard.	Recovered.	Amputation in the lower third of tibia.
4	July 20.	Wm. Davis.	19	Disease.	Leg.	" Carden.	Recovered.	Gun-shot wound of the knee-joint, a large charge entering on the outer side and extending to the joint, completely destroying the cancellous structure, and splintering the femur for nearly two inches.
5	July 9.	T. Reynolds.	19	Accident.	Thigh.	" Carden.	Recovered.	Disease of the whole shaft of the humerus, commencing in acute osteitis, immediately above the elbow-joint, thirteen months before admission into the hospital.
6	Aug. 17.	Wm. Perford.	34	Disease.	Arm.	" Sheppard.	Recovered.	Amputated below the knee. Died of pyæmia on the fourth day.
7	Aug. 23.	J. Merriman.	10	Accident.	Leg.	" Sheppard.	Died.	Cartilages found to be softened and ulcerated; surrounded with pus. Tibia and femur enlarged.
8	Sept. 15.	Susan Stag.	30	Disease.	Thigh.	" Budd.	Recovered.	Amputated in the lower third of the leg.
9	Oct. 17.	Jas. Hughes.	20	Accident.	Leg.	" Carden.	Recovered.	Amputation was performed, but with little hope he would long survive the operation, as the lower limbs were completely paralysed from a fracture of the dorsal vertebra.
10	1860. Jan. 21.	J. Bachelor.	41	Accident.	Leg.	" Carden.	Died.	Amputated about the middle of thigh.
11	March 17.	Sarah Delve.	47	Disease.	Thigh.	" Sheppard.	Recovered.	Amputation below the shoulder- and knee-joints. The patient lived but a few days.
12	Feb. 23.	Allen Bullock.	11	Accident.	Forearm.	" Sheppard.	Recovered.	Loss of blood very great before he arrived at the hospital, to which cause death may be referred.
13	Sept. 18.	Jno. Poulson.	37	Accident.	Arm and leg.	" Sheppard.	Died.	Inner condyle carious. Cartilages ulcerated.
14	Sept. 19.	Thos. Farley.	11	Accident.	Thigh.	" Sheppard.	Died.	Amputation was preferred to excision, on account of the patient's health. He died of phlebitis a few months after.
15	1861. Feb. 16.	R. Churchyard.	43	Disease.	Thigh.	" Carden.	Recovered.	The whole of the carpus was completely carious.
16	Sept. 14.	G. Caldicott.	50	Disease.	Arm.	" Budd.	Recovered.	Recovered, with a good stump.
17	Sept. 26.	R. Davis.	55	Disease.	Forearm.	" Budd.	Recovered.	A large quantity of blood was lost previous to the operation.
18	Oct. 31.	Betsy Newman.	31	Disease.	Thigh.	" Budd.	Recovered.	The joint was found extensively diseased.
19	Oct. 29.	Ann Moore.	39	Accident.	Thigh.	" Budd.	Died.	
20	Dec. 15.	F. Turner.	72	Disease.	Arm.	" Sheppard.	Recovered.	
21	1862. Jan. 2.	T. Bristow.	59	Disease.	Leg.	" Sheppard.	Died.	On the eleventh day, symptoms of exhaustion set in, with bronchitis. He died on the twelfth. Post mortem. All the organs were healthy, with the exception of the heart, which was small. The cavities were empty. Both ventricles were exceedingly thin and softened, and in a state of advanced degeneration.
22	July 14.	Elzth. Glover.	24	Disease.	Leg.	" Budd.	Recovered.	Amputated about the middle of the leg.
23	July 22.	Jas. Dallow.	13	Disease.	Thigh.	" Walsh.	Recovered.	This patient had hemorrhage a few days after the operation.
24	July 22.	Emily Jones.	12	Accident.	Thigh.	" Walsh.	Recovered.	A bad railway accident, rendering amputation necessary about the middle of the thigh.
25	Aug. 10.	Saml. Groves.	8	Disease.	Thigh.	" Sheppard.	Recovered.	The child's parents would not permit excision to be performed.
26	Aug. 25.	Wm. Clarke.	10	Accident.	Thigh.	" Sheppard.	Recovered.	A thrashing-machine accident. Amputation at the middle of the thigh; muscles divided circularly; skin flaps.
27	Sept. 25.	Wm. Selby.	55	Disease.	Leg.	" Walsh.	Recovered.	Amputated in lower third of leg.
28	Oct. 23.	John Lyles.	23	Accident.	Leg.	" Budd.	Recovered.	Amputated below the knee.
29	Aug. 22.	Thos. Powell.	63	Disease.	Arm.	" Walsh.	Died.	Removed about the middle of the arm.
30	Dec. 27.	C. Prossor.	17	Accident.	Leg.	" Sheppard.	Recovered.	Died from pyæmia.
31	March 14.	Jas. Shewell.	28	Accident.	Arm.	" Walsh.	Recovered.	Amputated immediately below the knee.
32	Dec. 10.	J. Treherne.	30	Disease.	Leg.	" Sheppard.	Recovered.	There was hemorrhage from the nutrient artery of the bone, requiring the actual cautery to suppress it. This man lost both feet from frost-bite.

ciently great to warrant in themselves any general inferences, but, as far as they go, are very favourable, when the cases are sifted. (Table II.)

Of fourteen primary amputations for accidents, nine recovered. Of the five deaths, one, No. 10, aged 41, was complicated with fractured spine; one, aged 37, No. 13, was a double amputation of leg and arm two, No 14 and 19, were apparently sinking from hæmorrhage when admitted (thigh cases); and one, No. 7, died from pyæmia (leg).

Of disease, two died, sixteen recovered. No. 20, aged 68 (arm), died of pyæmia. No. 21, aged 59 (leg), died on the eleventh day, of exhaustion, bronchitis and fatty degeneration of heart.

This table gives the following results.

		Deaths.	Recoveries.
Thigh11	{ Accident5	2	3
	{ Disease6	0	6
Leg10	{ Accident5	2	3
	{ Disease5	1	4
Arm5	{ Accident1	0	1
	{ Disease4	1	3
Arm & Leg 1	{ Accident.....1	1	0
Forearm ...5	{ Accident2	0	2
	{ Disease3	0	3
—		—	—
32		7	25
—		—	—

