

FOWLER (G. R.)

ON

# Excision of the Knee-Joint

BY THE

ANTISEPTIC METHOD OF LISTER,

BY

GEORGE R. FOWLER, M. D.,

SENIOR SURGEON TO THE BUSHWICK AND EAST BROOKLYN DISPENSARY;  
MEMBER OF THE AMERICAN MEDICAL ASSOCIATION; MEMBER OF THE  
MEDICAL SOCIETY OF THE COUNTY OF KINGS; MEMBER OF THE  
BROOKLYN PATHOLOGICAL SOCIETY; MEMBER OF THE  
BROOKLYN ANATOMICAL AND SURGICAL SOCIETY.

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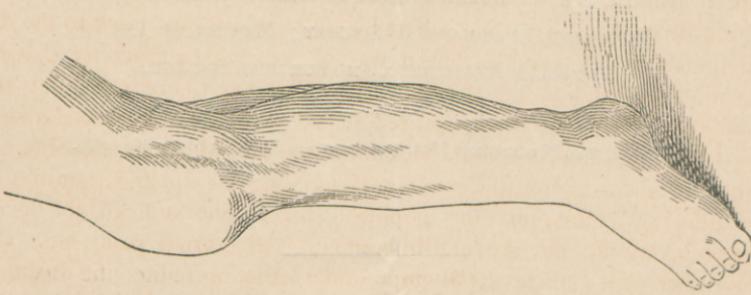


FIG. 1. From cast of limb made prior to operation.

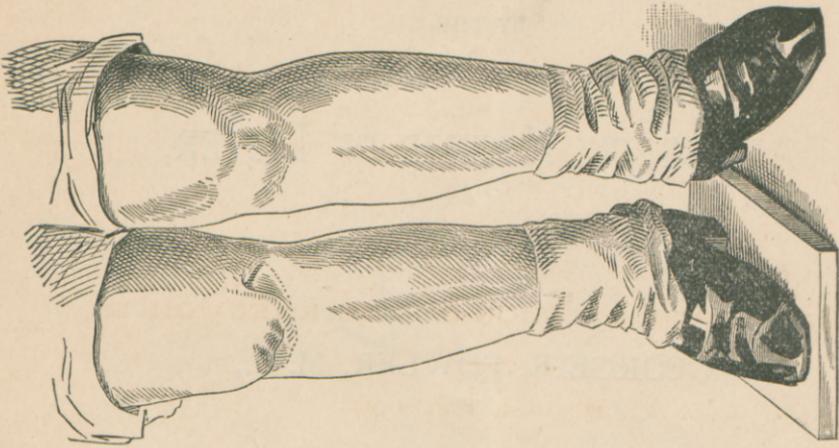


FIG. 2. From life, 20 months after operation.

DR. GEO. R. FOWLER'S CASE OF EXCISION OF THE KNEE-JOINT.

## ANTISEPTIC EXCISION OF THE KNEE-JOINT.

BY GEO. R. FOWLER, M.D.

Case: Mrs. S., widow, æt. 40, German. This patient came under my care in August, 1878, suffering from chronic arthritis of the knee-joint of one year's standing. She suffered a slight injury just prior to the development of the trouble, but it was of so slight a character that no attention was paid to it at the time. The plaster cast (Fig. 1) exhibits the condition of her limb as it appeared at that time. There existed a subluxation of the tibia and fibula backwards, the crucial ligaments being destroyed and the powerful flexor muscles forcing the upper extremities of the tibia and fibula into the popliteal space. She suffered the usual symptoms of chronic articular inflammation, nocturnal pain, etc. On November 15th I made the attempt under ether to reduce the luxation and retain the proper relations of the structures comprising the joint by means of a plaster-of-Paris dressing. The attempt was a failure, however, and after a protracted trial of the extension and counter-extension method with the limb elevated, I finally made the proposition, which was accepted, to excise the joint.

\* Read before the Medical Society of the County of Kings, N. Y., August 17th, 1880.

On December 18th, 1878, I proceeded to perform excision of the knee-joint under the carbolized spray of Lister, assisted by Drs. Lewis S. Pilcher and J. S. King. Esmarch's bandage being applied the curvilinear incision of Mackenzie was made. After removing the patella the leg was forcibly flexed, the ligaments divided and the soft parts cleared from the bones. A small Butcher's saw was then applied and a slice of the lower extremity of the femur removed by sawing from before backwards, a folded napkin protecting the contents of the popliteal space. The head of the tibia and fibula were then removed in the same manner. A few small vessels were secured by cat-gut ligatures, and a drainage tube of perforated rubber tubing placed in the bottom of the wound, its ends emerging from each upper angle. The sawn surfaces of the bones were then brought into accurate apposition and secured by silver wire passed through holes drilled in the bones at points corresponding to the attachments of the lateral ligaments. The wires were twisted tightly and the free ends reflected in such a manner as to lie between the sawn surfaces of the bones, where they were allowed to remain. The wound was closed with horse-hair sutures. A light hoop-iron splint was then secured to the posterior aspect of the limb by a few turns of a roller. Two iron bracket splints were then fastened in a like manner, one to the upper and the other to the outer surface of the limb. A piece of Lister's protective being applied to the region of the knee, the hoop-iron splints were still further secured in position by a plaster-of-Paris dressing, extending from the base of the toes to the lower margin of the incision, and again from the upper angles of the curvilinear incision to the upper portion of the thigh. This dressing entirely encased the whole limb except the region of the wound, holding securely in position the bracket splints, and these in turn firmly fixing the knee-joint. In the space left vacant the dressings were applied, consisting of the before-mentioned protective and a thick layer of Westhorp's antiseptic marine lint or carbolized jute, the whole being covered by a piece of Mackintosh cloth secured by a flannel roller.

From the moment the patient was removed from the operating table she gave me not a moment's uneasiness. She rallied without any difficulty from the shock, and her convalescence proceeded both rapidly and satisfactorily. The after treatment consisted in changing the dressings about once in twenty-four hours under the Lister spray. At the end of the third week, assisted by Dr. H. C. Rogers, I removed the splints and found that the bones had united in a very satisfactory manner. As a precautionary measure, however, the splints were reapplied in the same manner as at first and allowed to remain undisturbed until the seventh week, when, upon again removing them, firm union was found to have taken

place and the patient allowed to walk about. This she was able to do without any support. The silver wires were not removed, the incision having healed by first intention, and no traces of the retained wire were ever visible after closing the wound.

Although the bones were placed in line after the operation, and the sawn surfaces accurately fitted together, it is now evident that there is slight genu-varum. (Fig. 2.) This has been observed before by other operators and it is advised that the limb be placed, after operation, in a position of genu-valgum, in order to overcome the subsequent tendency to bow-leg.

This patient's surroundings were, at the time of the operation, and subsequently during her convalescence, of the worst possible character, from a sanitary point of view; they were well calculated to tax to the utmost the claims made in favor of the Lister plan of antiseptic treatment. She occupied the middle floor of a filthy tenement-house in the most crowded and dirtiest part of the Eastern District. The house is one of two buildings placed upon a lot of 20 x 100 feet; a very narrow courtyard lies between the two houses, and a part of this occupied by an over-filled privy vault at the time. No traps were placed upon the waste-pipes leading from the sinks, and the odor of sewer-gas constantly pervaded the place. The patient's quarters consisted of a small and crowded room in which the patient lay during her convalescence, and in which also the cooking, washing, etc., of the patient's family were done.

The complete immunity which this patient enjoyed, under such unpropitious circumstances, from the dangers and complications incident to excision of the knee-joint by the old method, led me to make inquiry into the subject. Being aware of the enthusiasm of our German brethren over Listerism—an enthusiasm, by the way, not in any degree approached by Lister's own countrymen—I addressed a series of inquiries upon the subject to the best known surgeons of Germany. From the majority of these I received prompt and courteous replies, giving me their experience in antiseptic excision of the knee-joint. The records thus obtained I have tabulated, and herewith present them as a contribution to the literature of antiseptic surgery.

Since the first successful knee-joint excision by Filkins, of Norwich, in 1762, and the almost classical case of Park, of Liverpool, in 1782, the operation has but slowly gained in favor. During the last twenty years, however, cases have multiplied more rapidly. The tardiness of its adoption may be accounted for by the fact of its great mortality. According to Volkmann, the German surgeons lost upwards of seventy-five per cent. of their cases prior to the introduction of Listerism. This extraordinarily high mortality, however, does not seem to have occurred elsewhere than in Germany; among the English and American surgeons much better

results have been obtained. Even with the French surgeons excision of the knee-joint—never with them a popular operation—gave much better results than those stated by Volkmann.

In order to have a substantial basis for comparison between what is called the old method and that known as the antiseptic plan of Lister, I have availed myself of a very exhaustive work by Culbertson,\* who has recorded in a tabular form upwards of 600 cases of excision of the knee-joint, operated upon without any especial antiseptic precautions. I have selected from his tables 582 cases of the operation, being all operated upon for disease, in which the results were fully stated. As far as the results have any bearing upon the question under consideration, they may be briefly stated as follows:

Total number of cases.....	582
Deaths from all causes.....	180
Deaths due to general disease or complications existing prior to operation.....	100
Deaths directly traceable to the operation, such as those due to pyæmia, septicæmia, erysipelas, gangrene, phlebitis, etc.....	80
Recoveries with useful limbs.....	296
Recoveries after subsequent amputation.....	56

This is the best possible showing for excision by the methods in vogue prior to the introduction of Listerism.

In addition to the heretofore unpublished cases of excision with Listerism, constituting the table compiled by myself, and hereunto appended, I have to acknowledge my indebtedness to Dr. Nathan Sack, of Dorpat, Russia, for a statistical table placed by him at my disposal.† An examination of the last mentioned gives the following:

Total number of cases.....	101
Deaths from all causes.....	21
Deaths due to general disease or complications existing prior to operation.....	13
Deaths directly traceable to operation, such as those due to pyæmia, septicæmia, erysipelas, gangrene, phlebitis, carbolic acid poisoning, etc.....	8
Recoveries with useful limbs.....	66
Recoveries after subsequent amputation.....	6

Turning now to my own table of antiseptic excisions, the following facts present themselves:

Total number of cases.....	66
Deaths from all causes.....	8
Deaths due to general diseases or complications existing prior to operation.....	5
Deaths directly traceable to operation (pyæmia, septicæmia, erysipelas, gangrene, phlebitis, carbolic acid poisoning, etc.).....	3

\* Excision of the Larger Joints of the Extremities. Prize Essay of the American Medical Association, 1876, by H. Culbertson, M.D. Supplement to Vol. 27, Transactions of the American Medical Association.

† Beitrag zur Statistik der Kniegelenkresection bei antiseptischer Behandlung. Inaugural Dissertation, von Nathan Sack, Dorpat, 1880.

The great boon claimed to be conferred by Listerism consists, as is well known, in the freedom from injurious irritations caused by the entrance of air laden with septic germs. But the absence of irritation may in its turn have some disadvantages, according to Kocher, Hueter, Volkmann and others. These surgeons ascribe an occasional failure to get firm bony union to the rapid healing of the soft parts, and the lessened inflammatory action in the excision wound. Kocher even goes so far as to recommend that the increased risk be incurred of a higher mortality by treating cases of excision of the knee-joint as open wounds, in order to attain a greater certainty of permanent bony union. He bases this upon the fact that of twenty cases treated by him in the way just stated, in all there occurred firm osseous union; on the other hand, of five cases treated antiseptically, the three recoveries healed with movable joints. Inasmuch as the functional result, now very generally aimed at by surgeons, consists in a firm ankylosis of the parts after excision, this question becomes a very important one. Nor can the occasional rare instances in which an active movement and a useful limb are combined be any justification for lack of care on the part of the surgeon in securing bony union wherever possible. One of the rare cases above alluded to took place in the practice of Mr. Annandale in 1872. The patient was a girl aged ten. The operation consisted in a semilunar incision through the integument, removal of the extremity of the femur, leaving the epiphysis intact, and removing a thin slice from the articular extremity of the tibia. The patella was also excised. When the patient left the hospital there was no union, and the case was considered by Annandale as having a very unfavorable termination. After the lapse of five years the patient again came under observation, exhibiting an extraordinarily useful limb, with an active movable joint. As before stated, such a result should never be expected, and will but rarely fall to the lot of any surgeon to encounter. In most instances, unless firm bony union can be obtained, amputation offers the only hope of freedom from the incumbrance of a worse than useless member.

Although the objections urged by Kocher against the antiseptic method in knee-joint excisions on the grounds just stated may be valid, it will require a much larger experience in this class of cases to warrant a surgeon in incurring increased risk of losing his patient by death in attempting to secure by the open treatment a better functional result. Moreover, the statistics as here presented do not bear out Kocher's views upon this point.

An inquiry into the causes rendering so perfectly useless a limb in which there has been a failure to secure a firm union, may not be out of place here. After excision the normal checking or locking apparatus is

lost. In the normal condition the checking or locking function is produced by the so-called checking facette of the cartilage of the external condyle of the femur, into which the outer border of the surface of the tibia fits; and it is still further assisted in full extension by the anterior border of the inter-condyloid fossa of the femur resting at the tibial eminence, and by the action of the inner ham-string tendons.

If I were to venture an opinion as to the cause of frequency of non-union in excision of the knee-joint, it would be that it was due to the want of a proper retentive apparatus during the process of healing. In my own case an exceedingly satisfactory result was obtained by the use of permanent silver wire sutures securing together the ends of the bones. In addition to these an immovable dressing was applied above and below the joint, and these connected together by iron bracket splints; not the slightest movement was possible between the sawn surfaces of bone. This method is not new, having been for a long time recognized as the best treatment for ununited fractures. Bidder particularly advocates this practice, conjoining with it or not, as circumstances require, ivory pegs acting as "dowel pins," driven into the extremities of the bones. A case thus treated antiseptically by Bidder, of knee-joint excision, gave an exceptionally good result in a very short time. Helmer also uses this method of ivory dowel pins and silver wire sutures, and claims that in his hands it never fails to result in prompt and decided bony union.

A very important question has arisen, relating to the arrest of development in the limbs of children who have suffered excision of the knee-joint. Although it may not appear exactly germane to the subject of the advantages of the antiseptic method of operating, yet I cannot refrain from alluding to it. It is now generally admitted as a fact that, in children, a removal of any considerable portion of the lower articular extremity of the femur results in a decided retardation in the growth of the limb. Humphrey confirms this; for, in eighteen cases of children under his observation, the growth was interrupted in all cases in which large portions of the bone were removed. The maintenance of the epiphysis he therefore concludes to be indispensably necessary to the growth of bone in children. Bryck, on the contrary, avers, however, that the retardation of growth in children, after this operation, is not entirely due to the removal of the epiphysis. He was able to point out, in several cases, the fact that, before operation, a faulty growth of the diseased limb existed.

In calling attention to the very great advantages, apparently, of Listerism over other methods of operating, as shown by these statistics, I am not unmindful that the former class of cases is very much smaller, comparatively, than the latter, and that further experience and study may somewhat modify the future aspect of the question. Yet the fact remains un-

disputed that a very much smaller death-rate is present in those cases in which Listerism was employed, as compared with the old methods.

In the following summary I have presented the most salient points, together with a statement of the comparative percentages of deaths, etc. :

SUMMARY.	Culbertson's table, old method.	Sack's table, antiseptic method.	The writer's table, antiseptic method.
Deaths from all causes.....	30.93 per cent.	20.79 per cent.	12 per cent.
Death due to pre-existing disease or complications.....	17.18 "	12.88 "	6 "
Deaths due to those influences supposed to be preventable by the antiseptic method of treatment, including in the writer's table two deaths attributed to carbolic acid intoxication.....	13.07 "	7.9 "	3* "
Recoveries with useful limbs.....	50.86 "	65.34 "	63.6 "
Total number of cases upon which this estimate is based.....	582	101	66

The following deductions may be drawn from the foregoing study :

1. The total mortality in excisions of the knee-joint has diminished about one-third since the introduction of Listerism into surgical practice.
2. The majority of the fatal cases operated upon antiseptically died of a pre-existing disease or complication.
3. Fatal cases directly referable to the operation and from causes such as are now considered preventable by antiseptic treatment are reduced fully 50 per cent.
4. The functional result is not influenced in a very marked degree by Listerism.

\* The remaining 3 per cent. of deaths were due to acute osteo-myelitis and exhaustion.

# Tabulated Synopsis of Sixty-six Cases of Antiseptic Excision of the Knee-Joint.

By GEO. R. FOWLER, M.D., Brooklyn, N. Y.

No. of Case.	Operator.	Sex and Age.	Indications for Operation.	Complications during Operation, and Points of Note while Patient was Convalescing.	Union of sawn surfaces, whether bony or fibrous.	Amount of Shortening.	REMARKS.
1	Prof. E. Rose, Contomis Hosp., Zurich.	Female, 21 yrs.	Caries of left knee-joint.	Tuberculosis; stupor produced by the use of carbolic acid.			Died 39 hours after operation of collapse, superinduced by carbolic acid poisoning.
2	"	Female, 21 yrs.	Caries of left knee-joint.	Caries recurred; a second operation performed at the end of six weeks.			Amputation performed one year later; amyloid liver diagnosed.
3	"	Female, 9 yrs.	Caries knee-joint.	Caries recurred.			Amputation performed at the end of six months.
4	"	Male, 18 yrs.	Caries of left knee-joint.		Very satisfactory fixation while in hospital; 17 months afterwards known to have bony union.		Discharged from hospital at the end of nine months, wearing plaster Paris splint. Seventeen months after operation, examined and found to be completely cured.
5	"	Male, 6 yrs.	Caries knee-joint.	In collapse after operation; necrosis where ends of bones were united by wire; excessive-suppurative.			Final result not stated in report.
6	"	Male, 30 yrs.	Complete and inveterate luxation of the knee-joint.	Stupor induced by carbolic acid.			Died at the end of six hours with symptoms of carbolic acid poisoning.

No. of Case.	Operator.	Sex and Age.	Indications for Operation.	Complications during Operation, while Patient was Convalescing.	Union of sawn surfaces, whether bony or fibrous.	Amount of Shortening.	REMARKS.
7	Prof. F. Ried, Jena.	Male, 12 yrs.	Anchylolysis of the right knee-joint.		Bony union in 2 months.	Very slight shortening.	Discharged, cured, at the end of three months.
8	"	Male, 18 yrs.	Caries of the knee-joint.				Amputation of femur subsequently performed, cured. Patient finally died of military tuberculosis.
9	Prof. von Nussbaum, München.	Female, 3 yrs.	Caries.		Bony union in 20 weeks.	1.2 ctm.	
10	"	Male, 16 yrs.	Anchylolysis at an angle of 75°.	Intractable spasmodic movements of the semi-tendinosus, semi-membranosus and biceps muscles.	Bony union in 5 weeks.	3.2 ctm.	
11	"	Male, 8 yrs.	Caries.	Fistula formed.	Bony union in 10 weeks.	1.5 ctm.	Caries recurred after two years.
12	"	Female, 24 yrs.	Caries.			1.2 ctm.	
13	"	Male, 11 yrs.	Caries.			1.5 ctm.	Refused to take nourishment. Died within twenty days of exhaustion.
14	Prof. Busch, of Bonn.	Male, 15 yrs.	Fungous inflammation of knee-joint.		Bony union within 3 yrs.		Second resection performed of sawn surfaces of femur and tibia; fistulous openings, however, still remain.

No. of Case.	Operator.	Sex and Age.	Indications for Operation.	Complications during Operation, and Points of Note while Patient was Convalescing.	Union of sawn surfaces, whether bony or fibrous.	Amount of Shortening.	REMARKS.
15	Prof. Busch, of Bonn.	Female, 26 yrs.	Bony ankylosis at right angle.	Healing of soft parts completed in twenty-one days after operation.	Bony union, 9 months.		
16	"	Male, 19 yrs.	Caries of the lower epiphysis of the femur and the upper end of the tibia.		Bony union incomplete after six months.		One fistulous opening at end of six months.
17	"	Male, 24 yrs.	Fungous tubercular inflammation of the knee-joint.				Exuberant tubercular granulation from the wound. Amputation of the femur.
18	"	Male, 31 yrs.	Caries of the articular surface of the tibia and of the external condyle of the femur.		Uncertain if bony union ever took place.		Wound healed under antiseptic treatment. When patient was discharged three fistulous openings had occurred; patient could flex his leg.
19	"	Female, 20 yrs.	Caries of tibia and femur.	Pyæmia.			Amputation of femur; died five days after amputation.
20	"	Female, 19 yrs.	Caries of tibia and femur.		Bony union within six months.		Healing without fistulous openings.
21	"	Male, 20 yrs.	Fungous synovitis.	Abscess of the thigh.	Bony union within six months.		Fistulous opening which finally closed.

No. of Case.	Operator.	Sex and Age.	Indications for Operation.	Complications during Operation, and Points of Note while Patient was Convalescing.	Union of sawn surfaces, whether bony or fibrous.	Amount of Shortening.	REMARKS.
22	Prof. Busch, of Bonn.	Female, 19 yrs.	Caries of the lower part of the femur following acute osteo-myelitis.	Elevation of temperature during the first three weeks. Abscess of the thigh.	Bony union within nine months.		After five months spicula of bone removed from tibia; after eight months all fistulous openings closed.
23	"	Male, 37 yrs.	Bony ankylosis at right angle.		Bony union within four months.		Cure without any sign of fever; no fistulous openings; nine weeks after operation was able to use the limb.
24	"	Female, 8 yrs.	Fungous inflammation of the knee-joint.	Healing process very slow.	After 16 months no bony union.		General health very much improved after operation; fistulous openings after sixteen months.
25	"	Male, 44 yrs.	Caries of the knee-joint.	Compelled to amputate at the thigh after seven and one-half months; rapidly progressive tubercular phthisis.			Died; post-mortem showed the sawed surfaces carious and not a sign of union visible.
26	Dr. J. Brandt, Klausenburg, Hungary.	Female, 18 yrs.	Caries of the right knee-joint.		Incomplete union when patient was discharged. A new patella, the size of a walnut, had formed.		Amputation performed two years afterward. At the operation it was found that the femur and tibia were firmly united. Patient died seven months after amputation. At the post-mortem amyloid and fatty degeneration of almost all of the internal organs.

No. of Case.	Operator.	Sex and Age.	Indications for Operation.	Complications during Operation, and Points of Note while Patient was Convalescing.	Union of sawn surfaces, whether bony or fibrous.	Amount of Shortening.	REMARKS.
27	Prof. August So- cin, Basle, Switzerland.	Female, 12 yrs.	Inflammation of right knee-joint with cartes.	Wound did not heal, but filled with fungous granulation.	Union of sawn sur- faces, whether bony or fibrous.	5 ctm.	Five months after the operation amputation of the femur. Rapid re- covery.
28	"	Male, 4 yrs.	For two years fungous inflammation of the knee- joint, with suppuration and several fistulous open- ings.	At the operation tibia found to be sound and a resection of the femur only per- formed; healing com- plete in one month.	Bony union incomplete; some motion in the joint.	5 ctm.	During convalescence the patient fell and sustained a fracture of the femur. Finally a good recovery; walks, with a support, consisting of a leather cap over the knee; he does not limp.
29	"	Male, 6 yrs.	Inflammation of the knee-joint, two and one- half years' standing. Leg badly nourished; posterior subluxation of tibia; limb strongly flexed.	No fever.	At ten weeks firm consoli- dation of the bones.	2.5 ctm.	Drainage openings healed slowly. Patient walks easily with a light sup- porting apparatus.
30	"	Female, 19 yrs.	Inflammation of the knee of three years' stand- ing. Fistulous opening consequent upon punc- ture; knee-joint exces- sively painful; circum- ference 36 ctm.; slight flexion.	No rise of temper- ature following oper- ation.	After four and one-half months con- solidation in- perfect.	5 ctm.	Discharged after four and one-half months; walking with a supporting apparatus.

No. of Case.	Operator.	Sex and Age.	Indications for Operation.	Complications during Operation, and Points of Note while Patient was Convalescing.	Union of sawn surfaces, whether bony or fibrous.	Amount of Shortening.	REMARKS.
31	Prof. Billroth.	Female, 6 yrs.	Tumor albus.	Gangrene of the borders of the flap followed by suppuration.	Firm bony union in 14 weeks.	3 ctm.	
32	"	Female, 17 yrs.	"	Wound healed by first intention.	No union.		Four weeks after the operation amputation of the femur performed.
33	"	Female, 4 yrs.	"	Healing by first intention, with the exception of some fistulous openings, which continued to discharge pus for several months.	Firm bony union after 9 months.		
34	"	Male, 9 yrs.	"	Wound healed by first intention. Subsequently caries; aluminuria.	No consolidation at the end of four months.		Patient not heard from after four months.
35	"	Female, 25 yrs.	"		Firm bony union within three months.	5.6 ctm.	

No. of Case.	Operator.	Sex and Age.	Indications for Operation.	Complications during Operation, and Points of Note while Resecting.	Union of sawn surfaces, whether bony or fibrous.	Amount of Shortening.	REMARKS.
36	Prof. Billroth.	Female, 8 yrs.	Tumor albus.	Primary union of the wound. Caries subsequently occurred and new fistulous openings formed, which finally healed.	After eighteen months no bony consolidation, but firm fibrous union.	5.6 ctm.	Final cure with use of limb.
37	"	Male, 23 yrs.	Contraction following chronic arthritis.		Firm union in ten weeks.	7 ctm.	
38	"	Female, 18 yrs.	Tumor albus.		Union in seven weeks.	5 ctm.	
39	"	Male, 7 yrs.	"	Caries recurred after rapid and uninterrupted healing.	No bony union at the end of ten weeks.	2.3 ctm.	Patient lost sight of.
40	"	Male, 9 yrs.	"	Suppurative osteomyelitis and periostitis.			Death on the 10th day.
41	Prof. E. Albert, Innsbruck, Austria.	Male, 17 yrs.	Contraction of the knee-joint following fungous inflammation.	Integument about the joint gangrenous in consequence of end of one strong tension. Silver sutures removed in 5 weeks. Some rise of temperature for 39 days.	Firm bony union at the end of one year.	4.5 ctm.	

No. of Case.	Operator.	Sex and Age.	Indications for Operation.	Complications during Operation, and Points of Note while Resecting.	Union of sawn surfaces, whether bony or fibrous.	Amount of Shortening.	REMARKS.
42	Prof. E. Albert, Innsbruck, Austria.	Female, 14 yrs.	Disease of both knee-joints; paralysis.	Resection of both joints at the same operation. Secondary hæmorrhage on evening following operation. Fever.	Firm bony union.		Patient walks with apparatus.
43	"	Male, 30 yrs.	Fungous inflammation of knee-joint. Capsule thickened; lateral motion.	Fever after 2d day; gangrenous spots in skin. Wound healed by first intention. Four months after, scrofulous ulceration. Patella subsequently removed.	Firm bony union.		
44	"	Female, 57 yrs.	Genu-valgum; lateral motion; considerable enlargement of the joint; pseudo fluctuation; no fistulous openings.	Fever and bronchitis, fungous granulations, osteomyelitis. Secondary operation.	No bony union at date of report.		Patient able to hold her limb up, when the joint describes a slight angle.
45	"	Male, 30 yrs.	Chronic inflammation of knee-joint.	Fungous growth from wound. Erysipelas, fever.			After two operations on account of fungous growths, amputation of the femur. Slow recovery.
46	Prof. von Bruns, Tubingen.	Male, 7 yrs.	Anchylolysis, spontaneous subluxation of tibia.	Abscess formed at sawn surface of tibia.	No union.		Amputation finally performed. Patient discharged, cured, within five months from first operation.

No. of Case.	Operator.	Sex and Age.	Indications for Operation.	Complications during Operation, and Points of Note while Patient was Convalescing.	Union of bony surfaces, whether bony or fibrous.	Amount of Shortening.	REMARKS.
47	Prof. von Bruns, Tubingen.	Male, 17 yrs.	Caries.	Healing delayed by subcutaneous abscesses.	Firm bony union in three months.	Shortening.	
48	"	Male, 12 yrs.	Knee ankylosed at a right angle.	No complications.	Union in two months.	1 ctm.	Patient walks without support in three months; heel and sole of foot raised.
49	"	Female, 13 yrs.	Anchylosis of knee and outward rotation of leg.	Delayed union of soft parts; abscess formed at inferior part of wound.	Bony union at fifth month.	3.3 ctm.	Patient discharged, walking without support.
50	"	Male, 35 yrs.	Fungous inflammation of knee-joint.	Several abscesses originating in wound.	No bony union.	10 ctm.	Patient discharged, cured, in seven and one-half months, wearing artificial support.
51	"	Male, 12 yrs.	Knee ankylosed at a right angle.	No complications.	Bony union in two months and seven days.	6.5 ctm.	Patient discharged in less than three months, wearing heel and sole of boot raised.
52	"	Male, 19 yrs.	Anchylosis of knee-joint, posterior subluxation of leg.	No elevation of temperature.	After seven months, union.		Patient left, wearing a plaster-of-Paris splint. At the end of seven months he was found wearing a raised heel and sole and working at his trade, as a stone-cutter.

No. of Case.	Operator.	Sex and Age.	Indications for Operation.	Complications during operation, and Points of Note while Patient was Convalescing.	Union of sawn surfaces, whether bony or fibrous.	Amount of Shortening.	REMARKS.
53	Prof. von Bruns, Tubingen.	Female, 17 yrs.	Anchylolysis of knee-joint.	External wound healed within three months.	Bony union (time not stated.)	2.5 ctm.	Patient walks, after five weeks, with a raised sole and heel to boot and no other support.
54	"	Female, 15 yrs.	Ulcerative inflammation of knee.	Healing of wound delayed; numerous abscesses at the lower extremity of femur.	Firm bony union at 10 months.	4 ctm.	
55	"	Male, 15 yrs.	Fungous inflammation of knee-joint.	No increase of temperature.	Union in 8 weeks.		Discharged in two months, cured.
56	"	Male, 23 yrs.	Osteitis of internal condyle.		Union firm in 7 weeks.		Discharged, cured, at end of seven weeks; works at his trade as mason.
57	"	Male, 31 yrs.	Ulcerative inflammation of knee-joint.	Primary union.	Bony union in 3 months.	3 ctm.	Discharged, cured, at end of three months and eight days from date of operation.
58	"	Female, 32 yrs.	Ulcerative inflammation of knee-joint.	Healing process very slow.	No union.		Constant suppuration; amputation of femur finally performed.
59	"	Female, 13 yrs.	Ulcerative inflammation of right knee-joint.	No complications; wound healed kindly.			Patient died of nephritis and pulmonary œdema several weeks later and before bony union was complete.

No. of Case.	Operator.	Sex and Age.	Indications for Operation.	Complications during Operation, and Patient was Convalescing.	Union of sawn surfaces, whether bony or fibrous.	Amount of Shortening.	REMARKS.
60	Prof. von Bruns, Tubingen.	Male, 9 yrs.	Fungus inflammation of knee-joint.	No fever; splints had to be removed three times during after treatment.	Firm union at end of 6 weeks.	2.5 ctm.	
61	"	Male, 18 yrs.	Left knee ankylosed at right angle.	But very slight elevation of temperature during first two weeks, none thereafter.	Firm bony union at end of 7 weeks.	3 ctm.	Discharged at eighth week, cured.
62	"	Male, 7 yrs.	Fungous inflammation left knee-joint.	Gangrene of borders of wound. Erysipelas, subsequent to its rapid healing.	Union when last seen, but not positive as to its being bony.	2.5 ctm.	Patient lost sight of at end of five weeks; flaps then not quite united.
63	"	Male, 24 yrs.	Fungous inflammation of knee-joint.	Considerable elevation of temperature; healing of soft parts slow.	Firm union at end of 6 weeks.	3 ctm.	
64	"	Male, 11 yrs.	Fungous inflammation of knee-joint.	Delayed union of wound; borders gangrenous; abscesses in thigh and leg.	Bony union in 4 months.	2.5 ctm.	Very useful limb.

No. of Case.	Operator.	Sex and Age.	Indications for Operation.	Complications during Operation, and Points of Note while Patient was Convalescing.	Union of sawn surfaces, whether bony or fibrous.	Amount of Shortening.	REMARKS.
65	Prof. von Bruns, Tubingen.	Male, 21 yrs.	Fungous ulceration of knee-joint. Fistulous openings leading into cavity of joint.	Rapid union of parts; very slight increase of temperature.	Firm bony union at end of six weeks.		Cure perfect, and patient walking about without support before seventh week.
66	Dr. Geo. R. Fowler, Brooklyn, N. Y.	Female, 40 yrs.	Chronic arthritis with subluxation backwards of the tibia.	Rapid recovery; no rise in temperature during whole period of convalescence.	Union very firm at third week; complete bony union at seventh week.	1 ctm.	Patient walks about without any support and with scarcely a perceptible halt in her gait.

Caries, 19; ulceration of cartilages (fungus inflammation), 17; deformity due to former disease in knee-joint, 16; osteitis of internal condyle, 1; chronic inflammation (tumor albus), 12; chronic inflammation of both knee-joints, 1.









