

There were thus 11 cases of compound fracture of the skull with two deaths, both due to the nature of the injury, and both occurring within forty-eight hours. In all the 9 cases which survived putrefaction was avoided, and the result was good.

The whole result of Mr. Lister's hospital practice in regard to compound fractures produced accidentally since 1871 is therefore as follows:—52 cases of compound fracture of the skull and long bones (53 fractures) were treated with 10 deaths.

Leaving out of consideration here all the cases which died within forty-eight hours, we have 44 cases (45 fractures) with 2 deaths, 1 from diphtheria and 1 from bronchitis and cardiac disease.

Or, taking the facts in another way, and, as is generally done, leaving out cases requiring primary amputation, we have 42 cases (43 fractures) treated conservatively with 6 deaths; and omitting also cases which died within 48 hours, and which have no bearing on the point at issue, we have 38 cases of compound fracture of the skull and long bones (39 fractures) with 2 deaths, 1 of these deaths being certainly independent of the wound.

In 31, or 81·5 per cent., of these cases the attempt to eradicate the causes of putrefaction was successful, and all of these cases recovered, *i.e.*, 31 compound fractures of the skull and of the long bones were treated aseptically without a death and, in the case of the limbs, without necessity for further operation.

I now propose to consider the compound fractures made by the

## II. COMPOUND FRACTURES

### Compound Fractures of

No.	Name and Age	Date of Admission, Operation and Discharge; with Result	Injury
54	James M., 13	<i>Ad.</i> , Jan. 22, 1873. Date of discharge not given. <i>Result</i> , cured.	Anchylosed knee-joint. Knee bent at right angles.
55	Alexander W., 37	<i>Op.</i> , June 18, 1873. <i>Result</i> , healed.	Ununited fracture of the femur-joint above the knee-joint.
56	Frances G., 54	See No. 6, p. 426. <i>Result</i> , healed.	Ununited fracture of the neck of the femur.

surgeon, and I would remark that Mr. Lister's osteotomies were in no sense of the word subcutaneous. They were real compound fractures; the wound in the bone communicated freely with the external world and a drainage-tube in most cases kept up this communication after the operation. In some instances the bone was simply chiselled partly through and then broken; in others, portions of the bone were removed. I have not included in this list excisions of joints for disease, partly for the reasons stated on p. 380, and also because in almost all the cases of diseased joints, sinuses are present before the patients come into hospital, and therefore the cases cannot as a rule be treated aseptically: 1 or 2 cases where a joint was anchylosed, and where a wedge-shaped piece of bone was removed, in other words where a compound fracture was produced on a *healthy* bone, are included.

From these cases the element of shock is excluded, and therefore we ought to have results comparable to the 38 cases of compound fracture with 2 deaths; and if these deaths were really independent of the wound, we ought here to have no deaths at all. Here also the certainty as to the ultimate result ought to be greater and the character of the results better; for here we have merely to *exclude* the causes of fermentation, whereas in the other cases we had to *destroy those which had entered*. In other respects they are comparable injuries, and, therefore, at the end I shall sum up all the compound fractures together, whether they have been made by the surgeon or have occurred accidentally.

### MADE BY THE SURGEON.

#### the Femur (Surgeon).

Treatment	Remarks
A wedge-shaped piece of bone was removed, and the leg was brought straight. Incision made over the seat of fracture.	Typical aseptic course. On February 2 all the stitches were removed, and every thing was healed, except where the drainage-tube was. All soundly healed on February 11.
Ends of bones refreshed by gouge and hammer. Wound left open.	Aseptic course. Completely healed during August. The temperature was taken once daily, and was only once up to 100°. No union. See Nos. 57 and 58.
Operated on.	Aseptic course. (See T. Chart IV.)

## II. COMPOUND FRACTURES

No.	Name and Age	Date of Operation and Discharge; with Result	Injury
57	Alexander W., 38 . . . . .	<i>Op.</i> , March 6, 1874. <i>Result</i> , healed.	See No. 55. Fracture still ununited.
58	Alexander W., 38 . . . . .	<i>Op.</i> , July 17, 1874. <i>Dis.</i> , Sept. 21, " <i>Result</i> , cured.	See No. 57. Fragments still ununited.
59	Thomas D., 37.	<i>Op.</i> , July 23, 1875. <i>Dis.</i> , Nov. 23, " <i>Result</i> , healed.	Ununited fracture of femur about its middle, of eleven months' standing. Various methods of treatment tried.
60	Richard K., 12.	<i>Op.</i> , Oct. 4, 1875. <i>Dis.</i> , Dec. 14, " <i>Result</i> , cured.	Aggravated knock-knee on one side.
61	Peter M., 30 .	<i>Op.</i> , Feb. 19, 1876. <i>Dis.</i> , July 27, " <i>Result</i> , cured.	Ununited fracture of the femur about ten inches below the great trochanter. Of ten months standing.
62	C. W. Y., 9 . .	<i>Op.</i> , March 14, 1876. <i>Dis.</i> , Oct. 14, " In process of cure.	Badly united fracture of the left femur just below the trochanters. Fracture occurred eighteen months previously. $1\frac{3}{4}$ inch shortening.
63	Thomas D., 38.	<i>Op.</i> , July 19, 1876. <i>Dis.</i> , Sept. 20, 1877. In process of cure.	See No. 59. Fracture still ununited.
64	Mary McD., 16.	<i>Op.</i> , July 15, 1876. <i>Dis.</i> , Feb. 7, 1877. <i>Result</i> , cured.	Double knock-knee. Patient could hardly walk. The deformity commenced two years previously, after a fever.

MADE BY THE SURGEON (*continued*).

Treatment	Remarks
Similar operation to the former. Fragments drilled in two places and iron pegs driven in. Two wounds made. Drainage-tube inserted.	The pegs became loose and were removed on March 16. The wound on the inner side healed April 29, and the other soon afterwards. Limb kept in plaster till June 8, and put up again till July 16, but still no union. The temperature was once up to 100° (100·1), on the morning after the operation.
A similar operation was again performed, and the leg was put up in plaster of Paris at once. (Intermediate amputation).	Putrefaction occurred here probably during the application of the plaster. As the temperature was going up, Mr. Lister thought it best to amputate. This was done on July 22, and the wound followed a typical aseptic course, healing entirely by first intention except where the drainage-tube was.
Ends of bone gouged. Drainage-tubes inserted.	Aseptic course. The blood-clot became organised as usual, and the gaping wound had completely cicatrised on September 12, without any pus-formation. Union had not occurred when the patient left hospital, wearing an immovable apparatus. (See T. Chart XXXI.) See No. 63.
An incision was made above the condyles of the femur down to the bone. Periosteum detached, and a wedge-shaped piece of the femur removed. Drainage-tubes inserted.	Typical aseptic course. No suppuration. Wound completely healed on November 14. Highest temperature was 99·6°. When seen some weeks after his discharge the femur was quite firm and the limb straight.
Incision on outer side of thigh. Ends of bone removed. Bones drilled and tied together with silver wire.	Aseptic course. Put up in plaster of Paris in April. Apparatus taken down on July 5. Bones united. Wire removed. (See T. Chart XXXII.)
Incision on the outer side of the thigh over the seat of fracture; bone divided; limb brought straight. Ends of bone refreshed and tied together with silver wire.	A good deal of constitutional disturbance followed the operation; the wound suppurated and abscesses formed. When the patient was discharged a small sinus remained unhealed. The femur was quite firm and the leg straight, and only $\frac{1}{2}$ in. shorter than the other. One or two small pieces of bone came away. Ultimately healed.
Ends of bones refreshed and tied together with silver wire.	Aseptic course. Patient was kept in hospital having various immovable apparatuses applied at intervals, but when discharged there was still a little mobility. The silver wire was left in, and the fragments ultimately united without further operation. (See T. Chart XXXIII.)
A wedge-shaped piece of bone was taken out of each femur on the same day. (See No. 60.) Drainage-tubes inserted.	Aseptic course. The right leg had completely healed at the end of August, and the left almost. Both limbs were put up in plaster of Paris on August 30. This was taken down on November 30, when both bones were found to be united (See T. Chart XXXIV.)

## II. COMPOUND FRACTURES

No.	Name and Age	Date of Operation and Discharge; with Result	Injury
65	Adam S., 6 . .	<i>Op.</i> , Aug. 1, 1876. <i>Dis.</i> , Dec. 4, " <i>Result</i> , cured.	Aggravated knock-knee on one side.
66	John T., 11 . .	<i>Op.</i> , June 29, 1877. <i>Dis.</i> during autumn. <i>Result</i> , cured.	Both knee-joints ankylosed at an acute angle—the result of previous disease.
67	Emma P., 9 . .	<i>Op.</i> , Nov. 20, 1877. <i>Dis.</i> , July 27, 1878. <i>Result</i> , cured.	Left knee-joint ankylosed nearly at a right angle.
68	George E., 12 .	<i>Op.</i> , Jan. 29, 1879. <i>Dis.</i> , Dec. 14, " <i>Result</i> , healed.	Ununited fracture of the neck of the femur of six weeks' standing (extracapsular).
69	Thomas E., 35 .	<i>Op.</i> , March 19, 1879. <i>Dis.</i> , May 15, " <i>Result</i> , cured.	Double genu valgum.
70	Jane D., 50 . .	<i>Op.</i> , April 9, 1879. <i>Dis.</i> , June 30, " <i>Result</i> , healed.	Ununited fracture of the femur.
71	Beatrice J., 14 .	<i>Op.</i> , May 16, 1879. <i>Dis.</i> , July 8, " <i>Result</i> , cured.	Genu valgum on the right side.
72	Frank J., 7 . .	<i>Op.</i> , May 21, 1879. <i>Dis.</i> , July 8, " <i>Result</i> , cured.	Genu valgum on both sides.

MADE BY THE SURGEON (*continued*).

Treatment	Remarks
Similar operation to No. 64. Drainage-tube inserted.	Aseptic course. Wounds quite superficial and almost healed on September 1. The femur was quite firm on September 4, but there was still slight divergence outwards. This was due to want of care in adjusting the splints during the holidays.
Left leg operated on. Only so much bone removed as was necessary to obtain a straight position of the limb.	Aseptic course. The greater part of the wound healed by first intention, but two sinuses were still unhealed in the beginning of September when Mr. Lister left Edinburgh. I hear that the patient left the hospital soon afterwards, with the wounds quite healed and able to move his knee very slightly (a movable knee-joint was aimed at in the first instance).
Portions of the end of the femur were removed, and the leg was got straight after division of the hamstring tendons. Horsehair drain.	Aseptic course. Wound healing by first intention except where the drain was. The drain was removed on January 12. A small abscess formed on the outer side of the knee, and was opened on February 5. A minute sinus remained here for a long time, the wound being soundly healed and the bones firm. It healed a few days after the patient was sent to a convalescent home.
A long incision was made on the outer side of the thigh over the great trochanter. The fragments refreshed and two drainage-tubes inserted. Long splint.	There was considerable constitutional disturbance after the operation, and the temperature at times was as high as 101.6°. A little suppuration occurred from the wound, but the greater part healed by first intention. A little bit of loose dead bone (apparently a chip from the operation) was removed on November 11, and then the sinus at once closed. Union did not occur. From the high temperature and the suppuration it is probable that some ferment had got in, but the discharge was not examined, and it never had any smell. (See T. Chart XXXV.)
MacEwen's operation on both thighs at the same time. Drainage tubes inserted.	Aseptic course. Both wounds had healed at the end of April. Union was then complete. Patient began to walk on May 5. (See T. Chart XXXVI.)
Ends of fragments refreshed and tied together with silver wire.	Aseptic course. No suppuration. Wound healed about May 15. Patient was discharged wearing an apparatus, but union did not occur.
MacEwen's operation on the right thigh. Drainage-tubes inserted.	Aseptic course. Healed about June 5. Splints removed and bones united on June 28. Began to walk on June 29. (See T. Chart XXXVII.)
MacEwen's operation on both limbs on the same day. Drainage-tubes inserted.	Aseptic course. Both wounds had healed by June 10. Union perfect on June 30. Joints freely movable. (See T. Chart XXXVIII.)

## II. COMPOUND FRACTURES

No.	Name and Age	Date of Operation and Discharge ; with Result	Injury
73	Lydia W., 9 .	Op., July 9, 1879. Dis., Aug. 19, " Result, cured.	Genu valgum on right side. See also No. 87.
74	Ethel S., 5 . .	Op., Oct. 15, 1879. Dis., Dec. 14, " Result, cured.	Double genu valgum.
75	John M., 15 .	Op., Oct. 22, 1880. Dis., Jan. 3, 1881. Result, cured.	Genu valgum on the right side.
76	Henry D., 17 .	Op., Nov. 5, 1880. Dis., Jan. 7, 1881. Result, cured.	Bony ankylosis of knee-joint of eight years' standing; leg at right angles to the thigh.

We have thus 23 cases in which compound fractures of the femur have been made by the surgeon (27 compound fractures). In all but 3 cases there was a typical aseptic course, *i.e.*, the patient ate as well and was as well in every respect as if he had not been operated on, while there was no suppuration from the deeper parts of the wound,

## Compound Fractures

77	John C., 44 . .	Op., Aug. 28, 1872. Result, healed.	Ununited fracture of both bones of the leg.
78	John C., 45 . .	Op., July 30, 1873. Result, healed.	Former case (No. 77). Still ununited.
79	John C., 45 . .	Op., Jan. 15, 1874. Dis., Sept. 3, " Result, cured.	Former case (Nos. 77 and 78). Tibia still ununited.
80	Eliza L., 23 . .	Op., June 6, 1874. Dis., Aug. 13, " Result, cured.	Badly united Pott's fracture. Leg much everted.
81	Eliza L., 24 . .	Op., March 17, 1875. Exact date of discharge cannot be ascertained. Result, cured.	Patient (No. 80) had used her foot too freely, and there was some return of the deformity.

## MADE BY THE SURGEON (continued).

Treatment	Remarks
MacEwen's operation. Drainage-tube inserted.	Aseptic course. No date of healing. Allowed to get up for the first time on August 12. Union then perfect and wound healed.
MacEwen's operation on both sides. Drainage-tubes inserted.	No local disturbance, but the temperature rose a little for a day or two, being once as high as 101°. The child, however, was quite well. On November 6 one wound was healed and the other nearly so. Both legs seemed to be firm at that time. (See T. Chart XXXIX.)
MacEwen's operation on the right side.	Aseptic course. Wound superficial on November 10, and boracic dressing applied. Patient got up on December 4. (See T. Chart XL.)
Wedge-shaped piece of bone removed. Horse-hair drain.	Aseptic course. On December 9 all healed except two spots where the drain was. Patient got up on January 2. Seen last on March 20, when he could walk well without any support. Bones quite firm. (See T. Chart XLI.)

and as a rule none at all from the superficial part. In one case where putrefaction occurred, secondary amputation was performed as being the safest treatment and also the best when the difficulty in getting union and the shortening of the limb were taken into account.

## of the Leg (Surgeon).

Ends of the bones refreshed and brought into good position. Wound left open.	Aseptic course. On November 5 the limb was put up in plaster of Paris. This was reapplied several times till July, 1873, but union did not take place. See No. 78.
Similar operation.	Aseptic course. On September 5 the wound was small and quite superficial. The fibula united, but the tibia did not. See No. 79.
Similar operation. Iron pegs were driven into the tibia.	Aseptic course. On March 12 union was found to have occurred, and the pegs were removed. The rest of the wound had healed. The patient was, however, kept in hospital for some time.
Fibula divided obliquely. Foot brought straight. Wound left open. Dupuytren's splint.	Aseptic course. Wound had healed and the bones were apparently firm when the patient was discharged.
Similar treatment.	Aseptic course. Kept longer in an apparatus. On this occasion the cure was permanent. (See T. Chart XLII.)

## II. COMPOUND FRACTURES

No.	Name and Age	Date of Operation and Discharge; with Result	Injury
82	Martha C., 28 .	<i>Op.</i> , Aug. 18, 1875. <i>Dis.</i> , Oct. 2, 1875. <i>Result</i> , healed.	Congenital deformity of right foot. Inversion of foot, the inner surface of which formed an angle of 140° with the axis of the leg.
83	William M., 36	<i>Op.</i> , Dec. 21, 1875. <i>Dis.</i> , March 2, 1876. <i>Result</i> , cured.	Badly united fracture of the leg with displacement of the foot backwards. Of fourteen months' standing.
84	Martha C., 28 .	<i>Op.</i> , Feb. 27, 1876. <i>Result</i> , cured.	See case No. 82.
85	Finlay McD., 29.	<i>Op.</i> , Jan. 16, 1877. <i>Dis.</i> , June 9, " <i>Result</i> , cured.	Badly united fracture of both bones of the leg, just below the tuberosity of the tibia. Leg bent inwards.
86	Alexander A., 23	<i>Op.</i> , July 19, 1877. <i>Dis.</i> , Oct. 13, " <i>Result</i> , cured.	Ununited fracture of both bones of the leg at the junction of the middle and lower thirds. Cf fourteen weeks' standing.
87	Lydia W., 9 .	<i>Op.</i> , July 9, 1879. <i>Dis.</i> , Aug. 19, " <i>Result</i> , cured.	Rickety deformity of one leg. See also No. 73.
88	Henry B., 32 .	<i>Op.</i> , Dec. 12, 1879. <i>Dis.</i> , March 31, 1880. <i>Result</i> , cured.	Badly united Pott's fracture. Foot much everted.
89	Frederick A., 26	<i>Op.</i> , Nov. 6, 1879. <i>Dis.</i> , Dec. 16, 1879. <i>Result</i> , cured.	Patient was admitted a fortnight previously with simple fracture of both bones of the leg. A fragment of the tibia projected under the skin, causing great pain and threatening to protrude.
90	Joseph B., 2. .	<i>Op.</i> , June 18, 1880. <i>Dis.</i> , July 15, 1880. <i>Result</i> , cured.	Rickety deformity of both legs.

MADE BY THE SURGEON (*continued*).

Treatment	Remarks
Fibula cut through and a wedge-shaped portion of bone removed from the tibia. Extensor tendons divided. Bones tied together by silver wire. Foot brought into straight position.	Aseptic course. Wounds superficial on September 18. When seen in February, 1876, the bone was still ununited. See No. 84. (See T. Chart XLIII.)
Tibia and fibula divided by lateral incisions. Foot brought straight. Dupuytren and horseshoe splints.	Aseptic course. Bones firmly united and only a little speck to heal on February 1.
Ends of fragments refreshed. Similar after-treatment to that formerly adopted.	Aseptic course. On this occasion union took place, but the dates of union and discharge are not given in the note books.
Fibula cut across. Wedge-shaped piece of bone removed from the tibia. A portion of the fibula cut away. Leg straightened, and wounds left open.	Aseptic course. Tibial wound found healed on March 1, and the fibular on March 3. Plaster of Paris removed on March 10, and the bones found to be firm. It was reapplied till May 1, when it was finally left off, the bones being quite firm and strong. (See T. Chart XLIV.)
Incisions over each bone, and the fragments refreshed. Iron pegs driven into the fragments of the tibia.	Aseptic course. The temperature rose on one occasion as high as 99.8°. Iron pegs removed on September 1, and wounds healed a few days later. On October 4 the bones were found to be quite united.
Incisions over the bones which were then cut across. Drainage-tubes inserted. No stitches.	Aseptic course. Date of healing not given. Patient allowed to get up for the first time on August 12. Union then perfect and the wounds quite healed.
An incision was made over the site of the former fracture, and the fibula divided obliquely. Foot inverted by means of pulleys. Drainage-tubes inserted. Dupuytren's splint.	Aseptic course. Wound quite superficial and boracic dressing applied on January 16. Splint left off and patient allowed to get up on February 24. There was a little pointing of the toes, which was overcome by elastic force. (See T. Chart XLV.)
Mr. Lister cut down on and removed the projecting portion, thus causing a compound fracture.	Aseptic course. On November 17 the wound was quite superficial, and boracic dressing was applied. The wound was healed and the bones firm when the patient left the hospital.
Incisions over the tibia and fibula. Bones divided. Wounds left open. Both legs operated on.	Aseptic course. No date of healing. Wounds quite healed and the bones firm when the patient was discharged. (See T. Chart XLVI.)

## II. COMPOUND FRACTURES

No.	Name and Age	Date of Operation and Discharge; with Result	Injury
91	Jessie C., 21½	Op., Oct. 29, 1880. Dis., Dec. 20, ,, Result, cured.	Bad rickety deformity of both legs.

Fifteen patients with compound fracture of the leg were treated without a death; and in these cases there were 31 separate compound

*Compound Fractures of*

92	Henry F., 16	Op., Feb. 4, 1875. Dis., March 2, ,, Result, cured.	Simple fracture of the clavicle; a fragment projecting under the skin, causing great pain and interfering with the adjustment of the fracture.
93	William A., 71	Op., June 1, 1877. Dis., Aug. 6, ,, Result, cured.	Unreduced dislocation of the acromial end of the clavicle. Of ten weeks' standing. Patient cannot use the arm well.
94	Elizabeth H., 22	Op., Feb. 12, 1879. Dis., April 12, ,, In process of cure	Cervical rib pressing forward the brachial plexus and causing great pain. Patient very hysterical.

There were 3 compound fractures of the clavicle without any bad

*Compound Fractures of*

95	Alexander S., 50	Op., Feb. 9, 1872. Dis., Sept. 5, ,, In process of cure.	Ununited fracture of the humerus of two years' standing. Various methods of treatment had been previously adopted.
96	James McB., 48	Op., Feb. 12, 1872. Dis., Oct. 10, ,, Result, cured.	Ununited fracture of the humerus at the junction of the upper and middle thirds. Of six months' standing.
97	John B., 14	Op., Dec. 6, 1872. Dis., Feb. 11, 1873. Result, cured.	Fracture of lower end of humerus with dislocation. Of five months' standing.

MADE BY THE SURGEON (*continued*).

Treatment	Remarks
Both bones in both legs divided, and wedge-shaped portions removed from the tibia. On the right side the bones were divided in two places.	Aseptic course. Wounds superficial and spray stopped on November 6. Exact date of healing not given; it was apparently about the end of November. Splints removed and the patient allowed to walk on December 14. (See T. Chart XLVII.)

fractures made. In no instance did any local or constitutional disturbance follow the operation.

*the Clavicle (Surgeon).*

Mr. Lister cut down and removed this loose portion, thus converting the case into one of compound fracture. Drainage-tube inserted.	Aseptic course. The wound had healed and the bone firmly united on March 6.
Articular surfaces removed and the ends of the bone tied together with silver wire. Wound left open.	Aseptic course. Wire removed on July 15. Healed on July 24. Union was perfect and the movements were greatly improved when the patient left hospital. (See T. Chart XLVIII.)
Mr. Lister cut down and divided the clavicle. Drawing aside vessels, &c., he removed the rib, which was attached to the sixth cervical vertebra, and articulated with the first and second ribs in front. Clavicle tied with silver wire. Drainage-tubes inserted.	Aseptic course. Wound healed by first intention, except where the drainage-tube was. Wound quite healed on March 12. The clavicle did not unite firmly till September. Wire removed during November. (See T. Chart XLIX.)

symptom.

*the Humerus (Surgeon).*

Ends of fragments sawn off, bones tied together by silver wire. Wound left open.	Aseptic course. Wire removed during March, and the wound quite healed on April 4. The bone was almost, but not absolutely, firm, and the patient was discharged wearing a silicate apparatus.
Ends of fragments refreshed and tied together with silver wire. Drainage-tube inserted.	Aseptic course. The greater part of the wound healed typically, but a sinus remained around the wire leading down to bare bone. On June 3, osseous union was complete. Wire removed on August 23. When discharged there was still a sinus leading down to bare bone.
Excision of elbow-joint by a longitudinal incision.	No constitutional disturbance. A small abscess formed on the outer part of the limb, and was opened on December 20. It had healed on January 20. The operation wound had entirely healed on January 6, except a minute superficial crack with the healing of which the movement of the arm seemed for some time to interfere. The movement was good when patient was discharged.