Deformities after fractures / by Frank Hastings Hamilton.

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BY

FRANK HASTINGS HAMILTON.

"That a 'cure' took place we do not doubt, but the information we should most desire would be on the length of the cured limb, and on a few other matters of that sort."

JOHNSON'S REPLY TO RADLEY.

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PREFACE.

I PROPOSE to deduce from my own experience, and from the experience of other surgeons, as recorded in this report, the true prognosis of fractures. This I shall endeavor to do with care and fidelity, avoiding, on the one hand, if possible, the error of encouraging the practitioner with a prognosis too favorable, and, on the other, the equal wrong of leaving him to expect too little.

To this end, I shall draw from my hospital and private records such cases as have come under my immediate care, describing, as briefly as will be consistent with my purpose, all those circumstances connected with each fracture which might in any way modify the result, together with the plan of treatment, and finally, the precise amount and character of the imperfection, or maiming, if any, which remains. I shall not, however, confine myself to my own cases; but, so far as I am able, I shall record the cases which have been treated by other regularly qualified surgeons, and which have subsequently passed under my own observation. This is necessary not only as a vindication of my own practice and reputation, of which one must naturally feel jealous, but more especially that my conclusions may have, what you have a right to demand for them, the weight of authority.

I shall, therefore, ask the liberty of reporting the practice of my contemporaries, and of mentioning their names, that you may judge for yourselves whether they constitute proper representatives of the present condition of our art. Of this, I trust, no one will complain, since without such permission I would not have ventured upon the duty assigned me, nor do I believe any one else would have consented to have occupied my place.

It is certain that, up to this moment, no one has volunteered to state fully what have been the results in his own practice, or in the practice of the hospital, or other similar institutions, which have been under his immediate charge. In hospital records, you may find patients admitted with fractures, and reported as "dead," or as

dismissed "cured," with the occasional interpolation of "a good leg;" and, upon these records, tables have been constructed to determine the average fatality of such accidents, and the probabilities of cure; but I have not yet seen any published reports declaring what was the exact amount and value of the "cure"—how much the bone was shortened, or bent, or otherwise maimed and deformed. In short, they still fail to inform us what are the "deformities after fractures," which, under fair treatment, may reasonably be expected.

Dr. Wallace published, in 1839, a statistical account of the eighteen hundred fractures which had been treated in the Pennsylvania Hospital from its foundation up to the year 1838; and Dr. Norris published, soon after, a similar report of the fractures treated in the same institution between the years 1830 and 1839, inclusive; but neither of these gentlemen make any reference to a shortening, or to any degree of deformity which may have occurred in the cases reported as cured. Dr. Peirson, in his report of the statistical tables of all the fractures which had occurred in the Massachusetts General Hospital up to the year 1840, notices, under the head of "Remarks," many interesting facts, such as delayed or non-union, the occurrence of ulcers, gangrene, &c. &c.; but there is nothing exactly pertinent to the subject of our inquiry.

Dr. Lente, who has recorded the statistics of fractures treated at the New York Hospital for the twelve years preceding 1851, has attempted to supply the deficiency, which he declares does exist in the hospital records, upon this subject, by his own "personal experience of several years in the practice of the hospital, and by conversation with other surgeons who have been connected with it." But he has limited his statements to what he believes to have been the average results, as regards shortening, in the treatment of fractures of the femur.

The statistics furnished by Lonsdale, of the Middlesex Hospital of London, and by Fricke, of the General Hospital at Hamburg, are equally silent upon the subject of deformities or shortening.

The same disinclination to approach this subject is manifested by those who have written special or general treatises upon fractures, and who, with the single exception of Malgaigne, will be found either to have ignored prognosis altogether, or they have seemed to speak of it only casually, and without any numerical basis for their calculations, since, among writers of equal experience and reputation, there exist the widest discrepancies of opinion. An example

will illustrate what I have said. Chelius, writing of fractures of the thigh-bone, says: "Fracture of the thigh-bone is always a severe accident, as the broken bones are retained in proper contact with great difficulty. The cure takes place most commonly with deformity and shortening of the limb, especially in oblique fractures, and those which occur in the upper and lower third of the thigh-bone." To which Mr. South, the translator, and Surgeon to St. Thomas's Hospital, appends the following note: "In simple fractures of the thigh-bone, except with great obliquity, I have rarely found difficulty in retaining the broken ends in place, and in effecting the union without deformity, and with very little, and sometimes without any, shortening. For the contrary results the medical attendant is mostly to be blamed, as they are usually consequent on his own carelessness or ignorance." (*Chelius's Surgery*, by South, American edition, vol. i. p. 627.)

Even Malgaigne, to whose recent work, entitled, *Traité des Fractures et des Luxations*, I shall hereafter have frequent occasion to refer, and who speaks generally with a precision which indicates a careful observation of the facts, does not intimate the existence of any exact records, either in his own practice or in the practice of others, from which his conclusions have been deduced.

In looking for an explanation of this seeming indifference, or palpable ignorance, upon a subject of such manifest importance both to surgeons and to their patients, I find several probable causes.

I suppose that most practical surgeons have a tolerably correct appreciation of prognosis in fractures. I say tolerably, because I wish to imply a qualification. I do not think that a majority of even "practical" surgeons have a full appreciation of the subject. I am frank to confess that, until I commenced these investigations, I had not any just notions of the frequency of deformities after fractures. Nor can I now understand how any surgeon, who does not carefully measure limbs with a rule or with a graduated tape-line, can have possessed himself of any very accurate information upon that point. Yet I appeal to surgeons whether this has been their constant or even their general practice? or whether they have not usually adopted, in measuring the lower extremities, that more simple, yet always unreliable method of placing the limbs parallel, knee to knee and heel to heel? or whether they have not as often contented themselves with the averment of the patient himself, that the limb was perfect? and, indeed, whether, in case of a fractured

arm or radius and ulna, they have, in one case out of ten, instituted any sort of inquiry or examination by which their relative length might be determined?* I address hospital surgeons as well as surgeons in private practice. Let them answer to themselves these interrogatories. If such examinations can be shown to have occasionally been made, we still venture to affirm that, in no instance, for any considerable length of time, have regular records of exact results been kept. Nor do I expect that, upon my humble remonstrance, such records, fairly made, will hereafter be kept.

Surgeons who have the charge of public hospitals understand that the eyes of their pupils, their governors, their confrères, and of the public even are upon them, and it is attributing to them nothing more than a common frailty to charge that they dare not record faithfully their results in the treatment of fractures. To be honest in the admission of shortcomings in a branch of our art, where the difficulties are so little understood by those who constitute themselves our judges, would be suicidal. Do you not see that jealous and designing colleagues would have no such discreditable results? Pupils would draw unfavorable comparisons, and desert the wards where failures were so common; rival hospitals would secretly or openly seize upon such records to their own advantage; and the patients themselves would, no doubt, often return the diligence, skill, and honesty of their surgeons with imprecations and prosecutions.

There is, gentlemen, no lack of charity in these suppositions. We are to take men as they are, and as they are well enough known to be, and not as we would have them; and it is in vain to deny that such are the fair risks which strict honesty in this matter must incur. The instinct of self-preservation, therefore, prompts to silence, or to the most favorable representations. Students will continue to go out from our hospitals with a belief that perfect union of broken bones is the rule, and that exceptions imply generally unskilful management; and if, when hereafter they have themselves occasion to treat a fractured femur, the result falls short of their standard of perfect success, they, taught also by the same instinct of self-preservation which actuated their teachers, will conceal the truth from

* "Le malheur de tous ceux qui ont cru obtenir de ces guérisons miraculeuses, c'est qu'ils n'ont pas même songé à mésurer comparativement les deux membres; je dirai plus, c'est qu'ils ignorent le plus souvent les conditions d'une bonne et fidèle mensuration."—*Traité des Fractures et des Luxations*, par J. F. Malgaigne, tom. i. p. 724. A Paris, 1847.

others, and even from themselves, if possible. Nay, I fear that sometimes, under the same urgent promptings, and where the moral sense is not superior to all other considerations, they may hesitate to regard the sanctity of an oath! How else shall we explain the testimony of that man who, with uplifted hand, affirms that he has "seen and treated ten fractures of the femur, in adult persons, and not one of them is in any way shortened or deformed?" Or what less charitable construction will you place upon the published averment of a hospital surgeon in a neighboring province, who, in his remarks upon my "fracture tables," as reported by my late pupil, Dr. Boardman, some years ago, declares that he has lately treated at the hospital under his care one case of fractured inferior maxilla; three cases of broken clavicles, two of which were at the outer third; seven of fractured femur, one of which was compound and one comminuted; eight cases of fracture of the tibia and fibula, two of which were comminuted and one compound—in all nineteen cases, and that, with the exception of one who died, *every case resulted in a perfect cure?*

It is more than probable that the writer will not escape similar criticisms hereafter, and that his report may be regarded as giving a true representation of American surgery, but as scarcely applicable to the surgery of others. In reply to a sentiment so illiberal, I beg to say, in anticipation, that having myself visited a majority of the large hospitals of Great Britain, and very many upon the continent of Europe, and having observed carefully their methods of treatment, and, in some measure, noticed their success, I am prepared to affirm that, in so far as I have yet seen, the practice of American surgeons, in the management of fractures, compares favorably with that of any other people. The English themselves are constantly proclaiming their deficiency in this department of surgery. It is now more than one hundred years since Pott, then Surgeon to St. Bartholomew's Hospital, inquired of his brethren if it was not "notorious" that in England broken thighs and legs were "often, *very* often, left deformed, crooked, and shortened?" But, notwithstanding Pott believed that he had discovered the true cause of these deformities, and had devised a remedy which must in future secure to his countrymen comparative eminence in this branch, yet to-day Mr. Skey, the very distinguished successor of Mr. Pott in the same great hospital, finds occasion to say: "One is therefore at a loss to find any apology for those surgeons to whose want of care, and even of humanity, may be attributed *the numerous examples of*

distorted and contracted members, which have cast a reproach on the surgery of Great Britain." (*Skey's Operative Surgery*, American edition, p. 140.)

For myself, while I take these admissions as evidence that Americans are quite as expert in the dressing of broken bones as the English, I am nevertheless much more charitable to their failures than they are themselves. To me these admissions only confirm a long-nourished conviction that neither in Great Britain nor in the United States, nor in any other part of the world, has the art of treating fractures attained that degree of perfection which surgeons have almost universally claimed for it.

If my reviewers deny the correctness of my conclusions, I trust they will do me the justice to accompany their denial with proofs of the same specific character, and obtained in the same careful manner, with those evidences which I shall present.

Finally, no man can be more sensible than myself of the imperfect manner in which I have accomplished the duty which you have imposed upon me, and especially since, while I have only contributed a limited experience to the elucidation of a very important subject—the subject of Prognosis in Fractures—I have, to an extent still more limited, contributed suggestions or experience in relation to better or more successful modes of treatment. Yet I trust no one will, for that cause, censure an humble beginning. Others may yet complete what I have only commenced. "Admit that bones and patients are and always have been contumacious and refractory. What then? "What good," do you ask, "can be accomplished by exposing our failures, unless we have found the remedy, in which alone the world can claim a final interest?" I reply, that the first step towards improvement in any art or science must be the faithful exposure of its wants and deficiencies.

CHAPTER I.

OSSA NASI.

CASE 1. *Simple displacement of left os nasi, laterally and backwards. Partial restoration.*

S. L., of Auburn, aged 10 years. While playing, one of his mates accidentally hit him with his elbow upon the left side of his nose. I was immediately called, and found the lower end of the left os nasi displaced laterally and backwards, so that it rested under the lower end of the right os nasi. There did not appear to be any fracture beyond that which was inevitable by the mere separation of its serrated margins from the bones adjoining.

With a steel instrument, introduced into the left nostril, I attempted to lift the bone to its place. The membrane was very sensitive, and the patient very restless under my repeated efforts. I pressed upwards with considerable force, and succeeded at length in bringing the bone nearly into position. In this situation, with some slight deformity remaining, I was compelled to leave it.

The hemorrhage, which was for a time profuse, soon ceased spontaneously.

CASE 2. *Simple fracture or displacement of the ossa nasi. Permanent deformity.*

M. L. P. T., of Saratoga County, aged 5 years, was struck by a boy's sled on the left side, completely flattening his nose, and turning the bones across to the right. Dr. John Thompson, a distinguished surgeon of Saratoga County, was in attendance, and, as well as it was possible to do so, lifted and replaced the nasal bones. For some months it was supposed that the restoration was perfect, and not until all swelling had disappeared was it ascertained to be still considerably displaced.

Thirty-six years after the accident I examined the nose. I find the ossa nasi are inclined over to the right, the deviation being in a straight line, and commencing at their upper ends. It is, therefore, a displacement, rather than a fracture. The left nostril is very much

obstructed, and has been all his life a source of much inconvenience. Within a few years, also, a cartilaginous growth in the left nostril has materially increased the obstruction.

CASE 3. *Simple fracture and displacement of the lower third of the right os nasi. Restoration after one week.*

D., of Attica, aged 11 years. The lower third of the right os nasi was broken, and displaced to the right side. The accident occurred a week since, and an attempt was immediately made, by an intelligent country surgeon, to replace the bones, but without success. The doctor then directed him to call upon me.

I introduced a strong steel instrument into the right nostril, and pressed upward and to the left, while with my thumb I pressed forcibly upon the right side of the nose. My object was to lift the bone, and carry it a little over to the left side. During the effort, the bones were felt to crack and give way slightly, but not sufficiently. I then gave him chloroform, as the manipulation had proved very painful, and again pressed in the same manner and with great force. The restoration now seemed nearly or quite complete.

CASE 4. *Simple fracture and displacement of the lower ends of the ossa nasi to the left side. Attempts at reduction unsuccessful. Deformity remains. Chronic ulceration of the septum, &c.*

N. B. N., of Hunt's Hollow, aged 27 years. Two years since he was struck accidentally upon the right side of his nose by a board, and the ossa nasi were displaced to the left. A surgeon made an attempt to reduce them, but did not succeed, and they have remained displaced ever since.

The nose for a time was much swollen. A few months after the accident, a purulent discharge commenced from the right nostril, and at length an abscess formed in the right cheek. The abscess is now healed, but the nose continues to discharge pus, and occasionally it bleeds freely. There is a perforation of the septum, of the size of a three cent piece, which is continuing to enlarge.

No hereditary maladies in the family, except that, on his father's side, it has been generally observed that wounds do not heal kindly. The same is the fact with him. When a child, he was very subject to epistaxis; at sixteen, a pulmonary difficulty began, and he had more or less cough, with hæmoptysis, for two years. Since then his health has been good. He is a lawyer by profession, but of late he

has lived in the country upon a farm, and has accustomed himself to much out-door exercise.

CASE 5. *Simple fracture, followed by deformity.*

Mrs. J. A., aged 23 years. Fifteen years ago she fell on her nose and broke down the ends of the ossa nasi. A surgeon of St. Gallen in Switzerland, replaced them.

There has remained ever since a slight elevation of the ends of the bones and of the cartilage, giving to her nose an aquiline form. The elevated portion is slightly tender, and occasionally, in damp weather, it is painful.

It is probable that, in replacing the fragments, they were lifted too high. Possibly, however, the slight deformity is due to an exostosis.

CASE 6. *Simple displacement of both ossa nasi backwards. No treatment. Deformity.*

Miss H. S., of Buffalo. When three weeks old, a block of wood fell upon her nose as she was lying in the cradle. The nature of the injury was not understood by the parents, and no surgeon was called.

The ossa nasi are now, twelve years after the accident, much wider than is natural, and depressed. The nasal processes of the superior maxilla appear to have been spread asunder. This having occurred when the bones were in a cartilaginous state, the parts must have been rather bent than fractured, and in this condition they have ossified. The deformity is very striking.

CASE 7. *Simple displacement of the lower ends of the ossa nasi backwards, complicated with fracture of the cranium and os femoris. Death on the seventh day. No attempt to restore the bones to place.*

W. W., aged 45 years, fell from a two-story building. Drs. White and Hamilton in attendance.

The ossa nasi were displaced rather than broken, being forced backwards from their articulations with the nasal processes of the superior maxilla, but not completely separated from their articulations with the os frontis.

As the injury to his skull was likely to prove fatal in a short time, no attempt was made to adjust the ossa nasi. He died on the seventh day.

CASE 8. *Simple displacement of the lower ends of the ossa nasi to the left side. No treatment. Displacement remains.*

Miss S. W., aged 8 years. She was struck accidentally, by a piece of iron, on the right side of her nose. Her parents did not suppose any serious injury was received, and no surgeon was called.

Ten years after the accident she called upon me for the purpose of having the deformity remedied, if possible. The lower ends of both ossa nasi are pushed over to the left side. I advised no interference.

CASE 9. *Simple displacement of lower ends of ossa nasi to left side. No treatment. Deformity remains.*

R. Jackson, aged 18 years. No surgeon was employed.

Ten years after the accident the deformity was very striking, both bones inclining to the left side.

CASE 10. *Simple displacement backwards of the lower ends of the ossa nasi. No treatment. Deformity.*

Henry Orb, aged 11 years. The accident occurred in Germany, and, his parents not suspecting the nature of the injury, no surgeon was called. Thirteen years after, he was an inmate of the Buffalo Hospital, and I found the bones very much displaced backwards.

CASE 11. *Simple displacement of lower ends of ossa nasi to the right. No treatment. Deformity.*

Wm. Hingston, aged 9 years. No surgeon was called. Eighteen years after the accident the displacement still continued.

CASE 12. *Simple fracture and displacement of lower ends of the ossa nasi to the left side. No treatment. Deformity continues.*

Mathew Powell, aged 19 years. This case came under my notice nine years after the accident, and the displacement still continued. He did not, at the time, suppose his nose was broken, and he did not consult a surgeon.

CASE 13. *Simple fracture and displacement of lower ends of the ossa nasi to the left and backwards. Treated by a "handy man" in Ireland. Deformity remains.*

Michael Gibson, aged 15 years, of Ireland. Michael called upon what, in that country, is known generally as a "handy man," or an uneducated "bone-setter."

Fifteen years after the accident, the fragments remained displaced

CASE 14. *Simple displacement of ossa nasi backwards. No treatment. Deformity continues.*

Jacob Kibbs, a German, aged 7 years, fell from a height of forty feet, striking on his face. His parents did not suspect the injury, and no surgeon was called. Twenty-four years after this he became an inmate of the Buffalo Hospital. The nose was then almost flat. The ossa nasi appeared unusually wide, and were sunken between the processes of the upper maxillary bones, which latter might be recognized by two parallel ridges on each side of the nose, rising above the level of the ossa nasi.

CASE 15. *Simple fracture and displacement of the lower ends of the ossa nasi to the left side. Treated by a "handy man" in Ireland. Deformity continues.*

Michael Kane, aged 30 years, of Ireland. This patient was treated also by a "handy man." Twenty years after the accident he was an inmate of the Buffalo Hospital. The deformity was then very striking. Lower ends of both bones incline to the left.

CASE 16. *Compound fracture and displacement of lower ends of both ossa nasi to left side and backwards. Complete restoration.*

George Reid, of Erie County, aged about 24 years. While employed in a sawmill he was struck by some part of the machinery, and was soon after found insensible. I saw him four hours after the accident. He could give no account of the injury, but it was evident that the blow which rendered him insensible had been received only upon his nose.

The ossa nasi were loose, and easily made to move under the fingers. The lower ends were pushed to the left side, and a little backwards. There was a wound on the right side communicating with the bones and with the nasal passages. The hemorrhage was profuse.

I introduced a straight steel instrument—a director—into the superior meatus, and, assisted by my fingers upon the outside, easily replaced the bones. With a small compress also placed upon the left side, supported by a strip of adhesive plaster, I sought to retain the bones in place. This was found necessary on account of a manifest tendency to fall off whenever the pressure was removed. The nostrils were plugged to arrest hemorrhages, and cold applications made to the outside of the nose.

I have never seen the patient since, and cannot declare positively the result; but I have reason to suppose it is perfect.

CASE 17. *Compound fracture of the ossa nasi. Treatment unsuccessful. Deformity.*

Thomas Burns, of Oppenheim, Fulton County, aged 3 years. The accident occurred from the kick of a horse, producing also a wound on the side of the nose which communicated with the fracture. Dr. Peter Yost, of Oppenheim, was his surgical attendant. The bones still remain considerably displaced, fourteen years after the accident.

CASE 18. *Compound fracture and displacement of the lower ends of ossa nasi to the right side, and backwards, with fracture of the nasal process of the superior maxilla on the left side. Treatment partially successful.*

G. C., aged about 40 years, was kicked by a horse on the left side of his nose, producing insensibility and convulsions, which lasted an hour or more. A clever surgeon attempted to restore the bones by introducing into the nostrils a female catheter. I think the instrument was too large.

When I saw Mr. C., about two hours after the accident, the lower ends of both nasal bones were displaced to the right, and backwards. The nasal process of the superior maxilla on the left side was also broken in. With a straight steel director, and with only moderate force, I lifted the bones into place. The hemorrhage not having ceased, I introduced a lint plug into the bleeding nostril. After two years, I find the form of the nose nearly, but not quite, perfect.

CASE 19.—*Compound fracture of the ossa nasi, complicated with other severe injuries. Death on the twelfth day.*

John Gallaghan, aged 31 years. The frontal, with the superior and inferior maxillary bones, were broken in at the same time. I lifted both the ossa nasi and the fractured os frontis; the restoration of the fragments was complete, but the patient gradually sank, and died on the twelfth day.

CASE 20. *Compound fracture of ossa nasi, complicated with fracture of the cribriform plate of the ethmoid, os frontis, &c. Death after about three months.* (*See skull in my private collection.*)

H. G., of Brockport, N. Y., aged about 14 years, was kicked by

a horse, breaking in the ossa nasi, os frontis, and ethmoid bone. Dr. Thatcher, of Brockport, was called and dressed the wounds. The lad was slightly comatose for a short time. A small portion of brain escaped. Dr. T. lifted the depressed os frontis as well as he was able, but only very partially.

The lad recovered rapidly, and soon returned to school, where his intellect seemed as bright as before. He could also cut and split a cord of wood a day.

About three months after the accident, and about eight days after the discharge of pus had ceased altogether, he began to complain of pain in his head, and in six days died comatose.

The autopsy disclosed a fracture, with depression of the os frontis, ossa nasi, nasal processes of the superior maxilla and ethmoid. The processes of the superior maxilla were driven backwards and laterally into the orbits, and the anterior half of the cribriform lamella, with a portion of the os frontis, were driven quite up into the brain. The septum narium was broken across in several places, and could have been of no use in assisting to restore the ethmoid. I allude to the suggestions occasionally made, that in such cases we ought to seize the septum with a pair of forceps, and attempt, in this way, to bring down the septum and ethmoid together.

Most of the fragments were completely united in their new positions.

CASE 21. *Compound fracture and displacement of ossa nasi. Union without deformity.*

H. W., aged 13 years. William fell while running, and struck upon the corner of a stone step, breaking the lower ends of both ossa nasi, and forcing them directly backwards. I saw him within an hour, and found the nose already much swollen, and bleeding freely with a flesh wound on the right side reaching to the bones. The fracture was not perceptible to the eye, but a crepitus was very manifest.

I immediately lifted the bones with a straight steel director, and without difficulty. Six months after the accident no deformity remained.

CASE 22. *Depression of ossa nasi, and fracture, with depression of nasal process of superior maxilla on the right side. Union, with deformity, &c.*

Thomas Kelly, aged 4 years, was kicked by a horse. Dr. Pratt,

of Buffalo, was in attendance within two hours. Nose and face then much swollen. It is probable that, owing to the swelling, which the mother says was already considerable, the fracture was not observed. Dr. P. dressed a lacerated wound upon the upper lip.

One year after the accident, I find both nasal bones depressed through nearly their whole length, and especially in their lower halves. The right nasal process is much depressed, and the right nostril obstructed. The lachrymal canals upon this side are closed.

Ossa Nasi.

No.	Age when it occurred.	Time since it occurred.	Sex.	Character of fracture.	TREATMENT.	RESULT.		
						United or not.		Perfect or imperfect.
1	10 y'rs	1 y'r	M.	Simple	Lifted bones with a steel instrument	United	Slight lateral displacement	Imp.
2	5 "	36 y'rs	"	"	Treated by a surgeon, but treatment unknown	"	Lateral displacement, nasal obstruction, &c.	"
3	11 "	1 w'k	"	"	Lifted bones with a steel instrument	"	Nearly or quite perfect	Per.
4	25 "	2 y'rs	"	"	Treatment unknown	"	Lateral displacement, ulceration, and catarrh	Imp.
5	8 "	15 "	F.	"	Treatment unknown	"	Slight deformity	"
6	3 w'ks	12 "	"	"	No treatment	"	Nose very flat	"
7	45 y'rs	7 d'ys	M.	Compl'd	" "	N. U.	Death on the seventh day	"
8	8 "	10 y'rs	F.	Simple	" "	United	Lateral displacement	"
9	18 "	10 "	M.	"	" "	"	" "	"
10	11 "	13 "	"	"	" "	"	Nose very flat	"
11	9 "	18 "	"	"	" "	"	Lateral displacement	"
12	19 "	9 "	"	"	" "	"	" "	"
13	15 "	15 "	"	"	Treated by a "handy man"	"	Lateral and backward displacement	"
14	7 "	24 "	"	"	No treatment	"	Nose almost flat	"
15	30 "	20 "	"	"	Treated by a "handy man"	"	Lateral displacement	"
16	24 "	3 "	"	Comp.	Lifted bones with a steel instrument	"		Per.
17	3 "	14 "	"	"	By a surgeon; treatment unk'n	"	Bones displaced	Imp.
18	40 "	2 "	"	"	Lifted bones with a steel instrument	"	Nearly perfect	"
19	31 "	12 d'ys	"	Compl'd	Lifted bones		Died on twentieth day	"
20	14 "	3 m'os	"	"		"	Bones remain depressed; died in three months	
21	13 "	6 "	"	Comp.	Lifted bones with a steel instrument	"	No deformity	Per.
22	4 "	1 y'r	"	Compl'd	No treatment	"	Deformity, nasal obstruction, and fistula lachrymalis	Imp.

REMARKS.

"Hippocrate se plaint que les chirurgiens de son temps y vont avec une sorte de timidité blâmable, et les malades eux-mêmes, qui payeraient si cher pour éviter une difformité, ne savent pas se prêter à ce qui est nécessaire. Ces réflexions, pour etre anciennes, n'en sont pas moins applicables à notre temps, et j'ai vu plusieurs fractures du nez dont la réunion vicieuse témoignait à tous les yeux ou de la faute du chirurgien ou de l'impatience des malades."—*Vidal (de Cassis)*.

I have, at the very outset, deviated widely from the rule which I had laid down for myself, not to report any cases except those which had been treated by regularly qualified surgeons. Of the twenty-two cases of fracture of the ossa nasi, only thirteen were seen by a surgeon in time to afford relief. It seemed to me necessary that we should be instructed how frequently the nature of this accident was overlooked by the friends, and even by the surgeon himself, to the end that we might be thus admonished of the necessity of always instituting in such cases, careful and thorough examinations. In some of the cases reported, where surgeons were called in time, and a deformity remains, it is not improbable that the accident was not recognized. The rapidity with which swelling ensues after severe blows upon the nose, concealing at once the bones, and lifting the skin even above its natural level, explains these mistakes.* The nose, also, is remarkably sensitive, and the patient is often exceedingly reluctant to submit to a thorough examination. It ought, however, not to be forgotten that the omission on the part of the surgeon to do his duty will not always be excused, even though the patient himself has protested against his interference, especially where an organ so prominent, and so important to the harmony of the face, is the subject of his neglect or maladjustment, since the most trivial deviation from its original form or position, even to the extent of one or two lines, becomes a serious deformity.

No one will be led into a false prognosis by a record of such cases so long as we are careful to point them out and separate them in our analysis, from those in which surgeons have been retained. I shall think it necessary, also, to mention several cases of fractures of the *septum nasi*, in which the character of the injury was not at first understood, and no surgical aid was obtained; but in no other

* "The diagnosis is often very difficult, even where there exists considerable displacement on account of the swelling."—Malgaigne, *op. cit.*, vol. i p. 366.

bones shall I find such frequent occasions to record similar oversights.

Of the thirteen cases to which a surgeon was called at first, three died within a short time, and no attempt to restore the ossa nasi was deemed necessary or proper. In two other cases it is probable that the nature of the injury was not recognized. Of the eight remaining cases, and in which attempts at restoration were immediately made by qualified surgeons, five are marked imperfect.

When the ossa nasi are struck with considerable force, from before and from above, a transverse fracture occurs usually within three to six lines of their lower and free margins, and the fragments are simply displaced backwards, or if the blow is received partially upon one side, they are displaced more or less laterally. This is what will happen in a great majority of cases, as I have proven by examinations of the noses of those persons who have been the subjects of this accident, both before and after death, and by repeated experiments upon the recent subject.

These fragments are generally loose and easily pressed back into place by the use of a proper instrument. A silver female catheter, which is so frequently advised by surgeons, may answer well enough in a few instances, but it will much more often fail. The diameter of the meatus at this point, where the instrument must reach in order to make effective pressure upon the ossa nasi, is on the average not more than two lines, and when the membrane which lines it is injured, it becomes quickly swollen, and reduces the breadth of the channel to a line or less. Under these circumstances, any instrument of the size of a female catheter could only be made to reach and press against the nasal process of the superior maxilla, which at this point is too firm and unyielding to allow it to pass without the employment of unwarrantable force. In this way it happens that the operator is occasionally surprised to find how much resistance is opposed to his efforts to lift the bones, and after repeated unsuccessful attempts the case is not unfrequently given over. If, however, he had used a smaller instrument, he would have found almost no resistance whatever. A straight steel director, or sound, or sometimes even a much smaller instrument, if possessing sufficient firmness, is more suitable than the catheter. For the same reason, also, one ought never to wrap the end of the instrument with a piece of cotton cloth as some have, I suspect, without much consideration, recommended.

What I have said of the facility with which these bones may be

replaced, when a proper instrument is employed, is true only when the treatment is adopted immediately, or at most within a few days after the accident. It is remarkable how rapidly these bones unite. In Case 3, the union was quite firm on the seventh day, so that I was obliged to use great force to replace the fragments; indeed, the fracture was reproduced. Hippocrates thought the union was generally complete in six days. Boyer, Malgaigne, and others have noticed the fact that these fractures were repaired with great rapidity. Nor has Malgaigne, whose observations are always very accurate, overlooked the fact, also, that their repair is effected without the interposition of provisional callus, but as it were "*par premiere intention.*" My own observation confirms this statement. Among all the specimens which I have seen in the various college and private collections illustrating fractures of the ossa nasi, and amounting in all to over forty, in no instance has there been detected, after a careful examination, the slightest trace of provisional callus.

I am not certain that it will always be found so easy to retain these loose fragments in place, as it is to replace them. The very swelling which takes place so promptly under the skin tends to depress the fragments, unsupported as they are by any counter force; a tendency which, possibly, is in some instances increased by attempts on the part of the patient to clear his nostrils by snuffing and hawking. I have, in one instance, Case 16, noticed very plainly a motion in the fragments when such efforts were made. How we are to remedy this I am not prepared to say. None of the plans which I have seen suggested possess, in my estimation, much practical value. Few patients will consent to the introduction of pledgets of lint, or of stuffed bags, or, indeed, of anything else, sufficiently far up into the nostril to answer any useful purpose. The membrane is too sensitive and too intolerant of irritants to enable us to have recourse generally to such methods. Then, too, it would require on the part of the surgeon more than ordinary tact to accomplish so nice and delicate an adjustment of the supports from below as these cases demand, where the slightest excess of pressure or the least fault in the position of the compress must defeat the purpose of the operator.

A more considerable force than that which I have first supposed, will break, generally, the ossa nasi transversely and a little above their middle, while, at the same time, the nasal processes of the superior maxillary bones may suffer slightly.

With neither of these accidents is the cribriform plate of the ethmoid likely to be broken or disturbed. Indeed, in numerous experiments made upon the recent subject, and in which the force of the blow was directed backwards and upwards, breaking and comminuting the nasal bones above and below their middle, with, also, the nasal processes of the superior maxillary bones, and the septum nasi, the cribriform plate of the ethmoid was, without an exception, uninjured. The exceeding tenuity and flexibility of the septum nasi at certain points, prevents effectually the concussion from being communicated through it to the base of the brain. If, therefore, after these accidents, cerebral symptoms are occasionally present, as in Cases 16 and 18, they must be due rather to the concussive effects of the blow upon the very summit of the nasal bones, where they rest immediately upon the nasal spine of the os frontis, or to some direct impression upon the skull itself.

The amount of force requisite to break in the nasal bones, at their upper third, is very great; no less, indeed, than is requisite to fracture the os frontis. If they do finally yield at this point, then no doubt the base of the skull must inevitably yield also. Nor do I think patients could often be expected to recover from an accident so severe. To this class of fractures belongs Case 20, in which not only the whole of the nasal bones were sent in—the nasal spine being broken at its base—but also the os frontis was depressed, the nasal processes of the upper maxillary bones broken and greatly displaced, and the anterior half of the cribriform plate of the ethmoid forced up into the base of the brain. If it is meant that in *these* cases the patient is in danger from injury done to the base of the skull, through the fracture and depression of the ossa nasi, we can appreciate the value of the opinion; but we do not understand how this danger can exist when the nasal spine of the os frontis is not broken, and the upper ends of the nasal bones are not displaced backwards. But, admitting that it were possible in this way to force up the base of the skull, it does not seem to me that we ought to attach any value to the advice occasionally given, to attempt to restore the broken ethmoid by seizing upon the septum and pulling downwards. A force sufficient to break the base of the skull, never fails to comminute and detach almost completely the septum nasi. We are to proceed in such a case as we would in a case of broken skull. We must lay open the skin freely, and with appropriate instruments seek to elevate and remove, if necessary, the fragments.

Indeed, after such accidents, we shall generally see plainly enough that death is inevitable, and that our services will be of no value.

Occasionally, I have observed, the bones are neither broken at their lower ends, nor through their central diameters, but only at their lateral serrated or imbricated margins. This is rather a displacement, or a dislocation, than a fracture. It is more likely to happen, I think, in childhood than in middle or old age (Case 22), and sometimes the lower ends only *bend* backwards or sideways. If there is more complete displacement, the upper ends are not usually forced backwards, but rather a very little forwards from their articulations with the os frontis, and the bones then swing, as it were, upon the lower ends of the nasal spine, as upon a pivot. In this condition, they are very firmly locked in, and it requires considerable force, applied under their lower extremities, to restore them to place. In Case 1, the bones were thus forced sideways, and without a fracture. In Cases 10 and 22, they are displaced backwards; and probably, also, the same thing has happened in several of the ancient cases, occurring in infancy or childhood, and the history of which is incomplete.

In children, also, the nasal bones may be spread and flattened, the lateral margins not being depressed or displaced, but only the mesial line or arch forced back, so as to press aside the processes of the superior maxilla, which deformity may become permanent, as in Cases 6 and 14.

The unusual morbid phenomena which followed in Case 4, such as catarrh, ulceration, &c., ought to be regarded as accidents due to the state of the general system, and as having no connection with the fracture, except as this injury served to awaken certain vicious propensities. Yet it is true that Mr. Benjamin Bell and others have spoken of "tedious ulcers," "polypi," impeded respiration, and impairment of the sense of smell and of speech, as circumstances apt to result from these injuries, and it is not improbable that such consequences have often followed.

CHAPTER II.

SEPTUM NARIUM.

CASE 1. *Lateral displacement of cartilaginous portion. No surgeon employed. Deformity remains. Nasal catarrh.*

W. H. W., of Cherry Valley, aged 15 years. Struck accidentally by a brickbat. The nose became immediately much swollen, and no surgeon was called. Eight years after the accident, the septum remained displaced laterally and to the left side, producing a slight lateral displacement of the end of the nose. He cannot blow freely through the left nostril, and he has had a catarrhal discharge from the same nostril from that time to the present.

CASE 2. *Cartilaginous portion broken down. A surgeon employed. Great deformity.*

Ledyard Littlefield, aged 19 years, was struck on the top of his nose by a ball. It became immediately much swollen. A surgeon was called, who said that no serious accident had occurred, but that when the swelling should subside it would be all right.

The nose is now, thirty-three years after the accident, almost perfectly flat, the cartilaginous portion of the septum being pressed entirely down and to one side.

CASE 3. *Cartilaginous portion broken down. A surgeon employed. Marked deformity.*

John Baptiste, aged 26 years, a Mexican by birth. The nose was broken by a blow. Dr. Beecher, of New Haven, Connecticut, was called. Four years after the accident, the septum remained displaced, and the nose much flattened.

CASE 4. *Fracture of the cartilaginous portion of the septum nasi. Slight deformity remaining.*

James Murphy, aged 25 years. The accident occurred three years ago, and the nose is slightly turned to one side by displacement of the septum. No surgeon was employed.

CASE 5. *Fracture of septum nasi. Deformity. Curious effect upon right side of face.*

A. A. C., aged 16 years, fell on his face upon the ice. The nose bled profusely. Employed no surgeon.

Seven years after the accident he called upon me, supposing that he had a polypus nasi. The septum is displaced to the right side, so as to almost completely close this nostril. This obstruction has existed from the time of the receipt of the injury. In very cold weather, when the vessels of the membrane are constringed, the passage is somewhat more free. The left nostril is proportionably wide.

During the last four or five years, the right side of his face has been subject to profuse perspirations. It is almost constant in summer, and frequent in winter. The line of division between the perspiring and non-perspiring portions of the face passes perpendicularly from the top of the centre of the forehead, along the ridge of the nose, and down to the centre of the chin. The phenomenon is due, perhaps, to an increased vascularity in the right side of the face; possibly to some peculiarity in the condition of the nervous trunks, occasioned by the nasal obstruction.

CASE 6. *Fracture of the cartilaginous portion of the septum nasi. No surgeon. Permanent deformity.*

Shannon, of Buffalo, aged nine years, fell on his face while runnine. No surgeon was called. The cartilaginous portion of the septum is broken at its junction with the perpendicular plate, and from this point downwards it inclines to one side, carrying with it the whole of the lower portion of the nose. Examined by myself two years after the accident.

CASE 7. *Fracture of the cartilaginous portion of the septum. Deformity. Successful operation for its relief.*

H—— C——, of Chicago, aged 18 years. This young man fell, while walking in his sleep, from a two-story window, striking upon his face. A surgeon was called, but he did not discover the nature of the injury to his nose.

One year after the accident he called upon me for relief. The cartilaginous portion of the septum was broken just at the ends of the nasal bones, and forced backwards about three lines, producing a striking depression at this point of the ridge of the nose, while at the same time the end of the nose was thrown up. The deformity

was very unseemly, and annoying both to himself and to his friends, who at first could scarcely recognize him. From a handsome Grecian, his nose had been converted into an ugly "pug."

Without promising much, I consented to operate.

Operation.—I introduced a narrow, sharp-pointed bistoury through the skin of the nose on the right side, and resting its edge upon the ridge at the junction of the cartilage with the ossa nasi, I cut the cartilaginous septum perpendicularly backwards about three lines, and then making a gradual curve with my knife, I cut downwards about eight lines towards the end of the nose. The intercepted portion of cartilage could now be easily lifted with a probe, and the line of the ridge of the nose completely restored. It was at once apparent, also, that lifting the cartilage would depress the tip of the nose, and restore its symmetry.

To retain the cartilage in place, I constructed a gutta percha splint, of the length and shape of the nose, but so formed along its middle as that it would not press upon the cartilage which I had lifted, resting well upon the ossa nasi, but not touching the ridge from the lower ends of these bones to the tip of the nose, at which latter point it again received support. I now passed a needle, armed with a stout ligature, through the upper end of the uplifted cartilage, transfixing, of course, the skin on both sides of the nose, and this I tied firmly over the splint. This accomplished, the important object of pressing backwards and downwards the tip of the nose, and thus tilting up the upper part of the ridge and septum, and of more effectually securing the cartilage in place by lifting it directly with the ligature. On the second day the ligature was removed, but the splint was continued two weeks, during most of which time a band was kept drawn across the lower end of the splint, and tied behind the neck.

To prevent the cartilage from falling back when final cicatrization occurred, I pressed the sides of the splint firmly towards each other, just below the incision, so as to press as much as possible the walls of the nares into the fissure in the septum, made by lifting it up.

The result is a complete and perfect restoration of the nose to its original form.

Septum Narium.

No.	Age when it occurred.	Time since it occurred.	Sex.	TREATMENT.	RESULT.		
					United or not.		Perfect or imperfect.
1	15 y'rs	8 y'rs	M.	Surgeon employed, but no treatment	United	Lateral displacement and catarrh	Imp.
2	19 "	30 "	"	Surgeon employed, but no treatment	"	Backward and lateral displacement. Nose flattened	"
3	26 "	4 "	"	Surgeon employed, but no treatment	"	Backward and lateral displacement. Nose flattened	"
4	22 "	3 "	"	No surgeon employed, and no treatment	"	Lateral displacement, and nose turned to one side.	"
5	16 "	7 "	"	No surgeon employed, and no treatment	"	Lateral displacement, and obstruction of nostril. One-half of face subject to abnormal sweats	"
6	9 "	2 "	"	No surgeon employed, and no treatment	"	Lateral displacement of septum and nose	"
7	18 "	1 "	"	Surgeon employed, but no treatment	"	End of nose tilted upwards. Successful operation after one year	"

REMARKS.

Of the "results of treatment" in cases of fractures or displacements of the septum narium, we have no facts or conclusions to record. In three of the seven cases no surgeon was employed, and in these, also, no surgical treatment was adopted, and it is quite probable that in only a small proportion of all the cases was the nature of the accident recognized. Such at least has been generally the statement of the patients themselves. The same causes will explain this which have been invoked to explain similar oversights in cases of broken ossa nasi. To which we may add, as an additional reason why it may be overlooked, the frequency of lateral distortions or deviations in the natural development of this septum.

The cartilaginous portion of the septum is that which is most frequently displaced by violence, and then it is usually at the point of its articulation with the bony septum. Next in point of frequency the perpendicular nasal plate is broken, and especially where it approaches the vomer. We omit in this enumeration, of course, those cases where the nasal bones themselves are broken down, in most or all of which the perpendicular plate is more or less fractured and displaced. We cannot say how often the vomer is broken, since it is beyond our observation, except in autopsies. It is probable, however, that the force of the concussion rarely reaches it, the cartilage or the perpendicular plate giving way first and easily.

Where the deviation is only lateral, the results are less serious, yet sufficiently so in a few instances to demand our attention. Lateral obliquity of the lower portion of the nose follows generally, but not uniformly, a lateral displacement of the cartilage, and when it does exist it is not always proportioned to the amount of displacement existing in the septum, so that the septum is then made to project obliquely across the nasal passage, causing often a serious obstruction and permanent inconvenience. In Case 1, a permanent catarrh accompanied this obstruction, and in Case 5, a curious sweating phenomenon, which is particularly detailed in the report. Neither of these circumstances ought, however, to be regarded as probable results, but only as rare instances of singular morbid events. Yet a catarrhal affection in the obstructed nostril is not very infrequent. It was observed not only in Case 1 of this chapter, but also in Case 4 of the chapter treating of broken ossa nasi. To what it may be due I shall not attempt to explain.

A depression of the cartilage forming a portion of the ridge of the nose is necessarily accompanied with a corresponding degree of lateral displacement, with or without fracture of its perpendicular portion, and produces, therefore, not only great deformity, sometimes a complete flattening of the end of the nose, but, also, in some instances, complete obstruction of the nostrils.

We conclude, from the limited experience which we are able to present, that fractures and displacements of the septum narium are generally followed by permanent deformity, and occasionally with still more serious results. We suggest, therefore, a more careful examination in recent injuries, with a view to the ascertainment of its lesions, and it would be well, certainly, if we could devise some reliable mode of treatment.

With no actual experimental knowledge upon this subject, we are left to the suggestions of others, and to our own speculations, neither of which are very satisfactory. It is doubtful whether a partition so thin and unsupported can ever be well adjusted and supported by artificial means. We possess, however, one advantage in the treatment of this accident which we do not in the treatment of broken ossa nasi, viz: facility of observation and of approach, and if we can do little with plugs and supports in the one case, we may possibly do more in the other. Nothing seems more rational, then, than to plug carefully and equally each nostril, with pledgets of lint, while we cover the outside of the nose completely with a nicely moulded gutta percha splint or case, which ought to be made

to press snugly upon the sides, and permitting these to remain for several weeks, or until the cure is completed. The *papier mache* of Dzondi, employed by him in cases of broken ossa nasi, would be equally applicable here; but the gutta percha, as being more plastic, and hardening more quickly, ought to be preferred.

Attempts to remedy the deformities of the nose at a later period, belong to the department of anaplastic surgery, and the modes of procedure must be varied according to the circumstances of the case. One instance of this kind I have related in Case 7, which was highly satisfactory, and which may serve as an example of what we may sometimes accomplish.*

CHAPTER III.

OSSA MAXILLARIA SUPERIORA.

CASE 1. *A compound fracture of the nasal process of the superior maxilla, complicated with fracture of the ossa nasi.*

G. C. (See Case 18 of Fractures of the Ossa Nasi.)

CASE 2. *Fracture of both upper maxillary bones, with partial separation at their articulations, and depression of the right malar bone. Recovery with permanent depression of the malar bone.*

Harvey, of Fond du Lac, aged twenty years. Harvey was thrown backwards from a loaded cart, one wheel of the cart passing over his face. He was taken up unconscious. I saw him next day. Consciousness had then returned.

The right malar bone was broken from its articulations, and forced down upon the antrum about three lines. Both superior maxillæ were loosened from their articulations, and could be moved laterally, the motion producing a slight grating sound. The same motion and grating occurred whenever he attempted to swallow. No effort was made to elevate the malar bones, nor did I find any means necessary to retain the maxillary bones in place, the amount of displacement being very inconsiderable, and never sufficient to be observed by the eye. Cool lotions were applied constantly to the

* See M. Dieffenbach's operation.—*Gazette des Hôpitaux*, 22 Fev., 1842. A Paris.

face, and the patient was sustained by a liquid diet. On the ninth day all motion of the fragments had ceased, and on the twenty-seventh day the patient was completely recovered, with only the depression of the malar bone remaining.

CASE 3. *Compound fracture of right inferior maxilla. Removal of floor of antrum. Recovery with slight depression of malar bone.*

M. P., of Colesville, Wyoming County, aged about thirty-four years, was thrown from a height, striking upon his face, and forcing the right malar bone down upon the antrum of the superior maxilla. Dr. L. Potter, of Varysburg, and myself were called.

The deformity produced by the sinking of the malar bone was very striking, and the patient, as well as ourselves, was very anxious to have it remedied if possible. We found some of the teeth upon the side of the fracture loose, and we determined to extract them and press up the bone with an instrument introduced through the empty sockets. The first attempt to extract a molar tooth, however, brought down several teeth, and the whole floor of the antrum. The detachment of this fragment was also now so complete that we believed it necessary to remove it entirely, a labor which was accomplished with infinite difficulty, and with no little hazard to the patient, as dissection had to be extended very far back into the throat, and in the end it was not effected without bringing out, attached to the fragment of maxillary bone, a considerable portion of the pterygoid process of the os palati.

The time occupied in this operation was at least one hour, during which we were every moment in the most painful apprehensions lest we should reach and wound the internal carotid, which lay in such close juxtaposition to our knife that we could distinctly feel its pulsation. After its removal, the hemorrhage was for an hour or more quite profuse, and could only be restrained by sponge compresses pressed firmly back into the mouth and antrum.

When the hemorrhage was sufficiently controlled, we proceeded to examine the antrum, the floor of which being removed entire, permitted the finger to enter freely. The restoration of the malar bone was now accomplished without much difficulty, and with only moderate force.

Two years after the accident, the face presented, externally, no traces of the original injury. The malar bone seemed to be as prominent as upon the opposite side, and there was no perceptible falling in where the teeth and alveoli were removed. During several

months after the removal of the bone, the antrum continued to discharge pus, but at length a semi-cartilaginous production closed in the cavity below, entirely reconstructing its floor, and the discharge ceased. Since then he has experienced no further inconvenience.

CASE 4. *Fracture of both upper maxillary bones, complicated with fractures of the nasal bones, and of the lower maxilla. Death on the twelfth day.*

(See Case 19 of Fractures of the Ossa Nasi.)

CASE 5. *Fracture of left nasal process, compound and complicated with fracture of the os frontis, nasal bones, &c. Death in three months.*

(See Case 20 of Fractures of the Ossa Nasi.)

The nasal process upon the left side was broken just above the root of the cuspid tooth, and its upper end was inclined inwards towards the nasal passage and backwards, until it was completely buried. In this situation it had become firmly united to the bony and soft tissues into which it was brought in contact.

CASE 6. *Fracture of the right nasal process, complicated with fracture of the ossa nasi et cart. Deformity remains.*

(See Case 22 of Fractures of the Ossa Nasi.)

Ossa Maxillaria Superiora.

No.	Age when it occurred.	Time since it occurred.	Sex.	Character of fracture.	TREATMENT.	RESULT.			
						United or not.	When united.		Perfect or imperfect.
1	40 y's	2 y's	M.	Comp. compl'd	Lifted with a steel instrument	United		Nearly perfect	Imp.
2	20 "	4 w's	"	Comp. compl'd	Cool lotions and rest	"	9 d's	Slight depression of the malar bone	"
3	34 "	2 y's	"	Comp. compl'd	Elevation of malar bone through an opening made at the base of the antrum	"		No deformity	Per.
4	31 "	12 d's	"	Comp. compl'd	No treatment; but rest, &c.	"		Death on twelfth day	Imp.
5	14 "	3 m's	"	Comp. compl'd	No treatment; but rest	"		Death in three months	"
6	4 "	1 y'r	"	Comp. compl'd	No treatment; but rest, &c.	"		United with depression	"

REMARKS.

"Fort rares et à peine étudiées."

These fractures assume so great a variety in respect of form, situation, and complications, that no general prognosis can be established.

When the harmonies of the upper maxillary bones are only slightly disturbed, as in Case 2, nothing but a contentive treatment is necessary. If the alveoli are extensively detached, they may be secured by dentists' gold or silver thread, but it is not always that a reunion of the fragments will occur. Ledran reports a successful case of this kind. See *Observations Chirurgicales*, tom. i. obs. 3. And Malgaigne remarks: "In all complicated fractures of the upper jaw, there is one principle which surgeons cannot too much study, namely, that all fragments, however slightly adherent they may be, ought to be most carefully preserved, and they will be found to unite with wonderful ease. This remark had already been made by Saviard. Larrey insists strongly upon it, and we have seen that M. Baudens, so great an advocate for the removal of loose fragments, has declared for these fractures a special exemption." (*Op. cit.*, vol. i. p. 376. Paris ed.)

Fractures and depressions of the nasal processes have been mentioned in connection with fractures of the ossa nasi. Such fractures occurred in Cases 1, 4, 5, and 6. It is seldom, unless they happen to be so exposed that they may be seized upon with forceps, that anything can be done for their relief.

I wish to suggest an expedient for lifting the malar bone when it has been thrust down upon the antrum of the upper maxillary, which may in certain cases be substituted for the mode which has been heretofore generally adopted.

In many instances, no difficulty will be experienced in resorting to the usual method. The recent loss of one or more teeth opposite the floor of the broken antrum, or the complete displacement of a tooth by the accident itself, will give an opportunity for the perforation of the antrum through the open socket, and for the introduction of a suitable instrument for lifting the depressed bone. Unless, however, the opening is quite large, the instrument employed must be so small, such as a straight steel sound or a female catheter, as to expose the parts against which its end is made to press, to some risk of being broken and penetrated. It is even possible in this way to penetrate the socket of the eye, and thus

inflict serious injury upon the eye itself. Yet, with some care, such accidents may be avoided, and it is probable that, in the cases supposed, where the sockets of the teeth opposite the base of the antrum are open, this method will continue to have the preference.

But if the teeth remain firm in their places, or if they have been some time removed, and the sockets are filled up, and we wish to enter the antrum at its base, we must either drill through its anterior wall above the roots of the teeth, or we must proceed to extract a tooth. The first method gives an inconvenient opening, and one through which it will be necessary to use a curved instrument; but yet it is a method far less objectionable than the extraction of a tooth which is firm, or which is even tolerably firm in its socket, and which may require the forceps for its removal. The objections to this latter procedure were suggested by our tedious and painful operation in Case 3. The first attempt to extract a tooth brought down the whole floor of the antrum, with all its corresponding teeth and the pterygoid process. The tooth was already loose, and we thought it might be easily taken out, but it had not occurred to us that it was loosened by the comminuted condition of the walls of the antrum, and of the alveoli. Nor do we now very well see how this condition should not always coexist with a depression of the malar bone, and why, therefore, an attempt to extract a tooth should not always, after these accidents, expose to the same hazards. Certainly it is no trifling matter to pull away all of a man's upper teeth upon one side, and to open freely into a broad cavity which might never close again, and which, in this event, must always serve as a place of lodgment for particles of food, and for foul secretions, to say nothing of the external deformity which it is likely to produce, and of the severity and even danger of the operation. Be assured that neither myself nor my excellent counsel and co-operator, Dr. Potter, will ever again attempt a similar feat.

I wish then to suggest a procedure, the value of which I have not yet had an opportunity to determine by any experiment upon the living subject, but which I have carefully and frequently tested upon the dead. It is only that we should employ for the purpose of lifting the malar bone, a screw levator, an instrument which I find already constructed, in a case of trephining instruments made for me by Mr. Luer, of Paris, and which I have often used and constantly recommended to my pupils, in certain cases of fractures

of the skull. The instrument ought to be made of the best steel, and with a broad, sharp-cutting thread. A slight incision being made through the skin, and down to the centre of the malar bone, the elevator is then screwed firmly into its structure, and now its elevation and adjustment may be accomplished with the greatest ease. In case the surgeon is not provided with this excellent instrument, a joiner's gimlet might answer tolerably well.

CHAPTER IV.

MAXILLA INFERIOR.

CASE 1. *Comminuted fracture. Union without deformity.*

Andrew Vandwie, aged twenty-four years. Fracture produced by a blow from a club. On the right side the jaw was broken just in front of the angle, and one molar tooth partially dislocated. On the left it was broken near the anterior mental foramen, and the corresponding tooth was partially dislocated. Both fractures were oblique.

I was called three days after the accident. The face was then much swollen. Assisted by Dr. John Trowbridge, I applied a felt splint, which was moulded to the form of the chin and face. I had previously extracted the loosened tooth, situated in the line of the most anterior fracture, chiefly with a view of closing the jaws completely, and of permitting him to imbibe his food through the opening thus made. I also replaced the loosened molar. No interdental splints were employed. On the sixth day we found that the sides of the felt splint being flexible, allowed, when the retentive bandages were applied, too much lateral pressure. The posterior fragments were, in consequence, made to fall inwards. We therefore substituted a well-moulded and well-padded copper splint, constructed with broad and slightly expanded wings. This apparatus was continued to the close of the treatment.

On the thirty-sixth day after the accident, the dressings were finally removed, and union was complete. The form of the jaw and the line of the teeth were perfect. No provisional callus could be felt. During a part of the time the patient had applied fomen-

tations of hops and vinegar, and without my knowledge. In consequence of this the acetate of copper had produced several slight ulcerations upon the skin, which soon healed when the splint was taken off.

About a week later I found the molar tooth, which I had replaced, loose and troublesome. I therefore removed it altogether. The cure was complete.

CASE 2. *Comminuted fracture. Union delayed. Result perfect.*

N—— B——, aged fifteen years, was struck violently with the heel of a man's boot, while lying upon the floor and upon his back. Fracture near the anterior mental foramen upon both sides, oblique. Suitable dressings were applied by a surgeon in Oswego, but considerable difficulty was experienced in retaining the fragments in place.

About two months after the accident he consulted me, the bones not having yet completely united. The dressings had been removed. I advised nothing but careful use of the jaw, and in a short time the union was complete and perfect.

CASE 3. *Compound comminuted fracture. Union without deformity.*

Jenks, a canal boatman, aged about twenty-five years, was struck by a stone thrown with great violence, breaking the inferior maxilla, on the left side, near the anterior mental foramen. A portion of the alveolar margin was also broken off, containing the sockets of three teeth.

Dr. Maxwell, of Lockport, dressed the fracture. Five days after the accident, the patient called on me, having continued upon his boat until he reached Buffalo. The face was then much swollen, the anterior fragment slightly displaced, and the portion of the alveoli, which had been secured in place by wires ingeniously belted upon the teeth, was quite loose. I removed the teeth and alveoli, placed cork splints between the molars, and applied a moulded pasteboard splint to the chin, securing it in place with a four-tailed bandage.

I found that, with this apparatus, it was impossible to prevent the anterior fragment from being slightly displaced backwards; nor could I draw the bandage so tight that, in the act of deglutition, a motion and grating were not perceptible between the fragments.

The union was completed in a few weeks. I think in about three, without any perceptible deformity.

Case 4. *Simple fracture. Union without deformity.*

—— of Colesville, aged about forty years. Dr. Parker, of Wyoming County, was in attendance. On the third day, Dr. Parker requested me to see the case with him, as he had some difficulty in retaining the fragments in place.

We found that, during the absence of Dr. Parker, he had carved from a block of wood, a splint which fitted accurately the chin and face, and served the purpose admirably for which it was intended. The fragments were well in place, and without interdental splints he was able to receive nourishment between his teeth. The dressings were permitted to remain. Four years after, I learn that the jaw is perfect.

Case 5. *Compound comminuted fracture. Union without deformity.*

C—— B——, of Little Falls, aged fifty-five years. Fracture through the shaft caused by the kick of a horse. A small fragment of the alveoli with one molar tooth was broken off, and removed by the surgeon at the first dressing.

Dr. Green, of Little Falls, dressed the fracture with a four-tailed bandage, pasteboard, &c., without interdental splints.

Seventeen days after the accident, I re-dressed the fracture at my college clinic. I found the fragments nicely in apposition, and not movable.

I applied an apparatus made entirely of leather, and of my own construction. The result I do not know positively, but as it was in place and united on the seventeenth day, I think I may assume that it is perfect.

Case 6. *Compound comminuted fracture. Slight permanent deformity.*

John Keef, an Irish laborer, aged seventeen years. John was thrown from a wagon breaking his leg at the same time. The inferior maxilla was broken on both sides through the shaft, and, also, exactly in the centre, vertically, between the central incisors.

I dressed the jaw with a four-tailed bandage, but found great difficulty in bringing up the left fragment to a line with the right, and therefore closed the jaws, and, finding that the left side fell three lines below the right, I placed a pine-wood wedge between the teeth on the right side, and drew the jaw up firmly. It now lacked only about half a line of being in place.

I had not thereafter much difficulty in maintaining quiet and

apposition of the fragments, and I supposed, from repeated examinations, that they were in exact line, until four weeks after the fracture had occurred, when I discovered that the central fragments were lifted about two lines above the lateral, and, also, slightly carried back; and although union had not taken place, yet they could not be replaced by any moderate force. The bones united with this slight deformity. Four days later no motion was perceptible, and the displacement seemed to be rather less From this time the dressings were discontinued.

CASE 7. *Compound comminuted fracture. Union without deformity.*

Augustus Cotesworth, aged eleven years, was kicked by a horse, producing a fracture on the left side of the jaw, between the first and second incisors, with an external wound communicating with the fracture. There was also a fragment of nearly two inches in length broken off from its lower margin. Four teeth were knocked entirely out from the upper jaw, and the face was badly cut and bruised. All the teeth in the lower jaw remained firm. The fracture was oblique. I removed immediately the loose fragments of bone. Between the teeth I placed splints of gutta percha, covered with cotton cloth. A firm and well padded splint of gutta percha was also applied to the under side of the chin, with broad wings, penetrated with fenestra, through which bands were passed, to be subsequently fastened over the top of the head. Care was taken that the sides of the splint should not press too snugly against the sides of the face and jaw. Corresponding to the wound in the face, an opening was made in the splint, through which the wound could be dressed, and the matter be permitted to escape.

Very little difficulty was experienced in the treatment of this case. The result is a cure without any deformity except what results from the scar on the face.

CASE 8. *Compound comminuted fracture, with fracture of the superior maxilla, ossa nasi, &c. Death on the twelfth day.*

John Gallaghan, an Irish laborer, aged thirty-one years, admitted to the hospital, October 3, 1851, with a fracture of the inferior maxilla, on the right side, near the centre of the shaft. Fracture compound, oblique, and comminuted. The ossa nasi, and ossa maxillaria superiora were also broken and displaced. Patient partially conscious.

I made only slight attempts to adjust the fragments, as death

seemed inevitable. He died comatose, on the twelfth day. (See Case 19 of Fracture of the Ossa Nasi.)

Case 9. *Simple fracture. Result not perfect.*

R—— B——, aged thirty-nine years. Fractured obliquely across the right angle of the jaw. Dr. Billings, of Hamilton, C. W., dressed the fracture, and, as far as I can judge, skilfully, with a four-tailed bandage. The bandage was continued three weeks. On the sixth week, Dr. B. extracted the last molar upon that side, finding that it interfered with the closure of his jaws.

Seven weeks after the accident, the patient called upon me. The fragments were united, but there was a large amount of callus upon the outside, and the posterior fragment was lifted up, so that the teeth were not on a line. The jaw does not close perfectly.

Case 10. *Comminuted fracture. Union delayed.*

Andrew Mahoney, aged twenty-six years, had his jaw broken by a blow with a club. On the right side, the fracture is between the two last molars. On the left side, it is broken just in front of the first molar. One of the molars was knocked completely out. He called on me seventeen days after the accident, and at this time no dressings had been applied.

The right side of the face continued much swollen. The fragments were loose and much displaced. On the left side, the anterior extremity of the posterior fragment fell inwards towards the mouth, and the whole anterior or central fragment was depressed and drawn backwards.

Assisted by Dr. Boardman, I applied a gutta percha splint to the outside of the jaw and face, and moulded splints of the same material between the teeth. The whole was secured by bandages very carefully and accurately. About ten days after this dressing was applied, he disappeared, and I have not seen him since. In the mean time, however, the fragments were kept tolerably well in place, but as the bones had not united at the end of four weeks, I suspect it has resulted in deformity.

Case 11. *Simple oblique fracture. Result perfect.*

I. W. S., of Darien City, aged twenty-six years, was struck by a club in the hands of some unknown person, while walking at night in one of the streets of Buffalo. He was for a moment bewildered, but never completely unconscious. The next morning he

called upon me. The inferior maxilla was broken obliquely, on the right side, just anterior to the last molar. The anterior fragment was displaced downwards and backwards.

Assisted by Drs. Nicholls and Pupikofer, I applied a gutta percha splint to the outside of the chin and face, and between the teeth I placed gutta percha wedges, moulded to the teeth and gums. The fragments now seemed to be in place, and well supported. S. returned home the same day, and soon after placed himself under the care of Dr. Ganson, of Batavia, who removed the gutta percha and substituted other dressings. Four months after the accident, I found the fragments perfectly in place, and no remaining deformity.

CASE 12. *Simple fracture. Result perfect.*

Joseph McEllicott, aged twenty-two years. Fracture near the angle of the inferior maxilla, on the right side.

It was treated by Dr. Johnson, of Cattaraugus. Bony union occurred in three weeks from the time of the fracture, and without deformity. This case was examined by myself soon after the cure was completed.

CASE 13. *Fracture and union without deformity.*

Albin Vanderheyden, aged thirty-seven years. The fracture occurred through the angle, on the right side. I examined the bone twenty-five years after the accident, and no deformity or imperfection could be discovered.

CASE 14. *Compound comminuted fracture, through the symphysis. Union with slight deformity.*

Norman Mason, aged twenty-five years. Broken by the kick of a horse. Left lateral incisor completely displaced, and a large piece of the alveoli detached. Dr. S. G. Ellis, of Gowanda, N. Y., dressed the fracture, securing the loosened fragment by the mainspring of a watch, made fast to the teeth by a silver wire, and closing the mouth completely, without any interdental splint. Upon the outside he placed a pasteboard splint and bandages. On the fourth week a fragment exfoliated, and came out under the chin. The union was delayed some six or eight weeks.

I examined the jaw ten years after it was broken, and found the line of a vertical fracture exactly through the symphysis mentis. The left half of the chin was slightly elevated, and the whole of that side of the shaft was smaller than the right. He cannot close his teeth perfectly, yet he can close them sufficiently for the pur-

poses of mastication. There is no perceptible external deformity. It must have been the loosened fragments of the alveoli secured by the wire, which subsequently came out through an opening below the ramus.

CASE 15. *Comminuted fracture. Union without deformity.*

Frederick Wm. Stephen, aged four years. His face was traversed by the wheel of a loaded cart, breaking the inferior maxilla through its shaft, on both sides. Assisted by Dr. Jno. Boardman, I proceeded at once to adjust and dress the broken fragments. To the chin and face we applied gutta percha splints, moulded carefully and accurately to the surfaces upon which it was laid. We employed, also, the same material as an interdental splint, having previously covered it with cotton cloth. It was observed that the posterior fragment was much higher on the right side than on the left, and it was found, also, exceedingly difficult, after the fragments were replaced, to prevent the left side from falling. We therefore placed the gutta percha only between the molars of the right side, leaving the left without any similar support, and now, by the pressure of the bandage, the left side was lifted and retained.

During several days, the swelling about the neck and face was very great, and the apparatus had to be frequently readjusted. The interdental splint, also, became displaced several times.

Bony union was much delayed, not having been complete until about the forty-second day. The dressings had been removed more than two weeks before this.

No perceptible deformity remained after the union was completed.

CASE 16. *Simple fracture. No treatment under fourteen days. Result unknown.*

Frederick Wm. Mande, aged forty three years. Fractured by a blow from a man's fist. The fracture was simple, and upon the right side, between the first and second bicuspid.

Frederick did not suppose his jaw was broken until two weeks after the injury was received, at which time he called upon me. A large swelling existed then, on the outside of the jaw, and the fragments were out of place and movable. The posterior fragment was elevated considerably above the level of the anterior fragment.

I applied a four-tailed bandage, and was able to bring the anterior fragment nearly in line. No splints were placed between the

teeth. I have never seen him since. I have, however, thought the case worthy of record, as illustrating how the patient himself may fail to discover, for many days, a fracture of his own jaw. The same thing occurred in Cases 10 and 18.

CASE 17. *Comminuted fracture. Union with deformity.*

John McNally, aged twenty-three years, a sailor, was struck on the right side of his face by a block, breaking the inferior maxilla upon the same side in two places. One fracture was through the ascending ramus, and just above the angle; the other was obliquely downwards and forwards through the shaft of the bone, and near the symphysis. No teeth were displaced. The intercepted fragment was forced inwards and downwards.

On the second day after the accident, Dr. Charles Wilcox, one of the Buffalo marine surgeons, took charge of the patient, and on the fourth day Dr. Wilcox invited me to present the case before my pupils. It was then dressed with a well-made gutta percha splint, secured with appropriate bandages to the chin and face. The teeth were all perfect, and the jaws were closed upon each other without any interdental splint, as it was found that he could still draw nourishment between his teeth. The fragments were in place.

The bone united in about three weeks, but he left the hospital and removed the dressings without authority, at the end of the second week. The intercepted fragment is displaced downwards and inwards, in the same direction in which it was when he first applied for treatment.

CASE 18. *Simple fracture. Delayed union.*

Daniel Moriarty, of Chicago, aged twenty-five years. Daniel was kicked by a fellow-countryman, on the left side of his face, breaking the lower jaw on that side just at the angle. The fracture was oblique. No teeth were displaced. The face immediately became much swollen, and he did not suspect the existence of a fracture. Two months after the accident he called upon me for advice. The left side of his face still remained much swollen, and motion between the fragments was very perceptible, especially in opening and shutting his jaw. The anterior fragment was carried to the left about one-quarter of an inch.

The failure to unite was probably due to the condition of his system, rather than to the neglect of surgical treatment. He was pale and feeble, having had intermittent fever more or less for nine

months. It is possible, however, that a small fragment remains loose at the point of fracture, and that this has, in some measure, caused the delay and swelling.

At my instance, he soon after placed himself under the care of Dr. Rano, of Pembroke, N. Y. Dr. R. extracted the last molar, and evacuated considerable pus. He has also taken measures at once to improve his general health. At the end of seventy days from the time of fracture, Dr. Rano informs me that it has not united.

Maxilla Inferior.

No.	Age when it occurred.	Time since it occurred.	Sex.	Simple, compound, comminuted, or complicated.	Transverse or oblique.	Point of fracture.	TREATMENT.	RESULT.			
								United or not.	When united.		Perfect or imperfect.
1	24 y'rs	3 y'rs	M.	Commin.	Oblique	Angle and shaft	Copper splints to outside. No interdental splints	United	5 w'ks	No deformity	Per.
2	15 "	6 "	"	"	"	Shaft	Unknown	"	3 mo's	No deformity	"
3	25 "	4 w'ks	"	Comp. commin.	"	"	Pasteboard splint to outside, and interdental splints of cork	"	3 wk's	No deformity	"
4	40 "	4 y'rs	"	Simple	"	"	Carved wooden splint. No interdental splints	"		No deformity	"
5	55 "	17 d'ys	"	Comp. commin.	"	"	Pasteboard splint, and subsequently a leather apparatus. No interdental splints	"	17 d'ys	No deformity	"
6	17 "	1 y'r	"	Comp. commin.	Oblique and trans.	Shaft and symph.	Four-tailed bandage, and interdental splints of pine wood	"	6 w'ks	Slight deformity	Imp.
7	11 "	4 y'rs	"	Comp. commin.	Oblique and trans.	Shaft	Gutta percha splint on the outside, and the same as in interdental splint	"		No deformity	Per.
8		12 d'ys	"	Comp. commin. compl'd.	Oblique	"	No treatment	Non-united		Died on the 12th day	Imp.
9	39 "	7 w'ks	"	Simple	"	Angle	Four-tailed bandage	United		Excess of callus and slight deformity.	"
10	26 "	4 "	"	Commin.	"	Angle and shaft	No treatment for 17 days. After this a gutta percha splint outside, and the same between the teeth	Delayed		Probably deformed	"
11	26 "	4 mo's	"	Simple	"	Shaft	For a few days with gutta percha splints within and without	United		No deformity	Per.
12	22 "	3 w'ks	"	"		Angle	Treatment unknown	"	3 w'ks	No deformity	"
13	12 "	25 y'rs	"			"	Treatment unknown	"		No deformity	"
14	25 "	10 "	"	Comp. commin.	Trans.	Symph.	Pasteboard splint on outside. No interdental splints	"	7 w'ks	Slight deformity	Imp.
15	4 "		"	Commin.	Oblique	Shaft	Gutta percha splints within and without	"	6 w'ks	No deformity	Per.
16	43 "		"	Simple	"	"	No surgeon, and no treatment under 14 days				
17	23 "		"	Commin.	"	Shaft and symph.	Gutta percha splint on outside. No interdental splint	"	3 w'ks	Slight deformity	Imp.
18	25 "	2 mo's	"	Simple	"	Angle	No treatment under 70 days	Non-united	70 d'ys	Lateral displacement, ulcers, &c.	"

REMARKS.

"La reduction assez facile à opérer est souvent difficile à maintenir."—*Vidal (de Cassis)*.

It is difficult, sometimes, and especially where the fracture is near the angle, to say whether it is oblique or transverse, but I have been unable to recognize a transverse fracture, except where, as in Cases 6, 14, and 17, the fracture was at the symphysis mentis. Of eighteen fractures, only three are recorded as quite or nearly transverse.

Fractures through the symphysis are rare, but it is quite common to find a fracture immediately in front of the angle, and at any point of the shaft between the anterior attachment of the masseter and the symphysis. I have seen no fracture of the coronoid process, and but one of a condyle.

In seven cases the bone was broken at two points, in one of which the two fractures were upon the same side. In one case the bone was broken at three points. Considerable fragments of the alveoli were detached in Cases 3, 5, and 14, and a fragment from the lower margin of the jaw in Case 7, but in neither instance was the effort to save the fragment successful.

It ought to be observed, also, that when the fracture has occurred at or near the angle, as in Cases 1, 9, and 18, and the second or third molars were disturbed, it has always become necessary eventually to remove them, and chiefly because they have interfered with the closure of the mouth.

In no instance has the bone finally refused to unite, although in a few instances it has been delayed, six, seven, ten, and even twelve or more weeks (Cases 15, 14, 2, and 18). I regard this fact as worthy of more especial attention, because of the extreme difficulty, if not actual impossibility, of preventing motion between the fragments, by any mode of dressing yet adopted. Any one who has observed attentively, must have seen, not only that his dressings are more often found disturbed and loosened, than in the case of almost any other fracture, unless it be the clavicle, and thus the fragments have been through all the treatment subjected to frequent changes of position, but, also, that even while the dressings remain snugly in place, the patient seldom is able to perform the necessary acts of deglutition, or to speak, even, without inflicting some motion upon the fragments.

Indeed, the rapidity with which this bone unites has, I think,

been observed by other surgeons, and I have myself noticed one instance, in an adult person, Case 5, in which the bone was immovable at the seat of fracture on the seventeenth day, and, perhaps, earlier. In other instances, the union has been speedily effected after the removal of all dressings.

It would be very unsafe from these few cases to deduce any conclusions as to the effect of slight motion in retarding the union of broken bones. Yet I shall take the liberty of referring to some remarks upon this subject, published by myself, in the *Buffalo Medical Journal*, vol. x. p. 142, in connection with an article entitled "New Mode of Treating Ununited Fractures of the Humerus."

The amount of deformity resulting, also, from these fractures is usually very trifling, whatever treatment has been adopted. Seven are marked imperfect, but one of these cases was complicated with other injuries of which the patient died in a few days, and one was a case of delayed union, at the time of writing this report. Only five of the united fractures are imperfect, and in none of these is the imperfection such as to be noticed in a casual examination of the face. The deformity which is usually found, is a slight irregularity of the teeth, produced, in most cases, by a falling of the anterior fragment, and in one case by a slight elevation of the anterior fragment. But even this does not always interfere with mastication, and would often pass unnoticed by the patient himself. It is probable, too, that time, and the constant use of the lower jaw in mastication, will gradually effect a marked improvement in the ability to bring the opposing teeth into contact. I think I have observed this in several instances.

Where the prognosis is so favorable we shall, perhaps, feel less necessity for suggesting any modifications or improvements in relation to the surgical treatment. We cannot refrain, however, from making a few practical hints.

It will be seen that the few cases in which attempts have been made to restore a dislocated tooth to its socket, or to retain it when much loosened, have generally proved abortive, and especially where the fracture is near the angle, and a molar has been disturbed. I believe it would be better practice always to remove this latter when it is much disturbed, and in cases where teeth farther forward are loosened, we might be somewhat less persevering in our efforts to retain them.

The same remark applies, also, to fragments of alveoli, which have been detached completely, and are held only by the soft tissues

about them. Complete exfoliation has sooner or later occurred, or the surgeon himself has found it at length necessary to remove them. (See Remarks on Fractures of the Upper Jaw.)

As to the employment of interdental splints, every one knows how inconvenient they are, both to the patient and to the surgeon, and I need not say that they ought to be dispensed with whenever it is possible to do so.

They are soon covered with an offensive sordes, and, as usually made, they irritate the mouth with their rough surfaces, and are constantly liable to displacement. Yet instances must occur in which these wedges are indispensable, and I wish to call your attention to the advantage which gutta percha possesses over every other material, in its adaptation to this purpose. I have already employed it in four instances, and I find no practical objections to its use.

The mode of preparing gutta percha, and of adapting it between the teeth is as follows: Dip a couple of pieces of the gum, of a proper size, into boiling water, and when they are sufficiently softened, mould them into wedge-shaped blocks, and, having wrapped each block with a piece of cotton cloth, carry them to their appropriate places between the back teeth. Immediately press up each horizontal ramus of the jaw until the mouth is sufficiently closed, and the line of the inferior margin is straight. In this position retain the fragments a few minutes, until the gum has sufficiently hardened. Meantime, it will be practicable, generally, to introduce the fingers into the mouth, and to press the gutta percha laterally on each side towards the teeth, and thus to make its position more secure. When it is sufficiently hardened, remove the splints for the purpose of determining more precisely that they are properly shaped and fitted.

The superiority of this splint is now at once perceived. If properly made, it is smooth upon its surface, and not, therefore, so liable to irritate the mouth as wood or cork, and it is so moulded to the teeth that it will never become displaced. My friend, Dr. Ganson, of Batavia, believes that the gutta percha will itself irritate the mucous membrane, and he, therefore, removed the splints which I had inserted in Case 11. I think he is probably correct, although I have never observed this effect myself. But in Case 11 the gutta percha was not covered with cloth, a precaution which I have since always adopted, and which I desire to recommend.

I have found the same material, also, particularly convenient as

an outside splint, since it is so easily moulded to the face, and its form may be readily changed from time to time as the swelling increases or subsides. In compound fractures, also, where the wound is external, an opening can be made through the splint suitable for the dressing of the wound, and the discharge of pus. The piece from which this splint is made should be two or three lines in thickness, covered with cloth, and padded under the chin. It will be found convenient to cover it with cloth before immersing it in the hot water. The water should be nearly at a boiling temperature, so that the splint may become perfectly pliant; and it should be laid upon the face and allowed to mould itself while the patient lies upon his back.

Having long experienced the insufficiency of the ordinary dressings to resist the tendency in the anterior fragment to fall downwards and backwards, when oblique fractures exist upon both sides, I devised some years since a leather dressing, which may be found useful hereafter in some cases.

It is composed of a firm leather strap, called maxillary, which, passing perpendicularly upwards from under the chin, is made to buckle upon the top of the head, at a point near the situation of the anterior fontanelle. This strap is supported by two counter straps, called, respectively, occipital and frontal, made of strong linen webbing. One of these, the occipital, is attached to the posterior margin of the maxillary strap about half an inch above the ear, and being carried around behind and *under* the occiput, it is finally buckled to the maxillary strap upon the opposite side, and at a point exactly corresponding to its origin. The frontal stay simply antagonizes the occipital; and having its origin and termination at the anterior margins of the maxillary strap, it is buckled horizontally across the forehead, and just above the eyebrows.

The maxillary strap is narrow under the chin to avoid pressure upon the front of the neck, but immediately becomes wider so as to cover the sides of the inferior maxilla and face, after which it gradually diminishes to accommodate the buckle upon the top of the head. The anterior margin of this band, at the point corresponding to the symphysis mentis, and for about two inches on each side, is supplied with thread holes, for the purpose of attaching a piece of linen which, when the apparatus is in place, shall cross in front of the chin, and prevent the maxillary strap from sliding backwards against the front of the neck. (Fig. 1.)

The advantage of this dressing over any which I have yet seen, consists in its capability to lift the anterior fragment almost verti-

Fig. 1.

The Author's Apparatus.

cally, and at the same time it is in no danger of falling forwards and downwards upon the forehead. If, as in the case of most other dressings, the occipital stay had its attachment opposite to the chin, its effect would be to draw the central fragment backwards. By using a firm piece of leather as a maxillary band, and attaching the occipital stay above the ears, this difficulty is completely avoided.

NOTE.—At my request, Dr. Mütter, of Philadelphia, has furnished me with the following engraving of an instrument recommended and occasionally used by him in the treatment of such fractures of the inferior maxilla as are not easily retained in place by the usual apparatus. The instrument is a silver clamp, and it is intended to be placed over the teeth and alveoli in such a way as to traverse the seat of fracture. It is more simple than the apparatus of Lonsdale, while the principle upon which it acts is nearly the same. (Fig. 2.)

Fig. 2.

Mütter's Clamp for Fractured Jaw.

CHAPTER V.

CLAVICLE.

SEC. I.—INCOMPLETE FRACTURES.

CASE 1. *Partial fracture through the middle third. Result perfect.*

M. K., aged four years, fell down a flight of stone steps. Dr. G. Burwell and myself being called, found the right clavicle bent forwards at the outer end of the middle third.

We immediately applied Fox's apparatus.

Twenty-six days after the accident we examined the clavicle, and ascertained that the cure was completed, and without any deformity. During most of this time, however, the dressings were quite loose.

Eight years later I examined the arm, and there remained nothing to indicate the place where it had been broken.

CASE 2. *Fracture through the inner third. Result imperfect.*

Miss McN., aged nineteen years, broke her left collar-bone, by coming in contact with a bridge while riding on the Erie Canal. The fracture occurred at the outer end of the inner third. I saw her the day following. The fragments were not completely separated from each other, but bent forwards at the point of injury.

By pressure, I attempted to restore the ends to place, but with only partial success. I dressed the arm with Fox's apparatus.

Ten years afterwards, I find the bone still bent forwards at the point of fracture. The arm is often painful, and the clavicle is tender where the bend occurred. In other respects it is as sound as it was before.

CASE 3. *Fracture through the middle. Result not perfect.*

A. B., aged three years, fell from the sofa on to the floor, striking, it is thought, on her right shoulder. Two days after this she fell again, and then, for the first time, Mr. B. noticed the deformity of the clavicle.

She was brought to me three days after the second fall. There

existed then a round, smooth projection at the outer end of the middle third of the clavicle. It felt hard, like bone. The line of the clavicle was not changed. I think, however, there existed a partial fracture, or that the bone having been bent, had at once resumed its original place spontaneously, and that the projection consisted of provisional callus.

I advised a handkerchief sling, simply to steady and support the arm.

Seven months after the accident, she fell sick and died. The projection continued at the time of death, only slightly diminished.

CASE 4. *Fracture through the middle. Result perfect.*

H. S., aged six years, was thrown from a horse, bending his left clavicle near its middle. Surgeon, Alden S. Sprague, of Buffalo. The projection in front was for several days very apparent, and was examined by myself at Dr. Sprague's request. The bone did not seem to be out of line. Dr. Sprague used no dressing. Five years after the accident, at the date of this report, I have examined the lad, and cannot find any trace of the original injury.

CASE 5. *Fracture through the middle third. Result perfect.*

Robert M. Frazer, aged twelve years, was run against by a wagon, breaking or bending both clavicles at about their centres. Dr. Wyckoff examined the fractures, and directed a simple sling, with cool lotions. He had previously attempted to straighten the bones, but was unable to do so completely.

On the second or third day, Dr. Wyckoff sent the lad to the college dispensary. I was unable, also, to restore the bones, and I recommended a continuance of the same simple plan. He was advised, however, to lie a few days upon his back. Six years after the accident, Dr. Mendenhall, of Cincinnati, examined the clavicles at my request, and informs me that no traces of the accident can be found. The projections remained some time, but just how long the mother does not remember.

I assume that this was a case of bending, in which the bones immediately resumed their places, and that what we supposed to be a projection of the fragment was provisional callus.

CASE 6. *Fracture through the middle third. Result perfect.*

Robert M. Frazer. (Same as Case 5; opposite arm.)

CASE 7. *Fracture through the middle third. Result perfect.*

T. D. S., aged two years, fell and broke or bent his collar-bone near its middle. Dr. H. O. Harmon, of Montpelier, Vt., dressed the arm.

Twenty-four years after the accident no traces of the accident can be discovered. The arm is perfect.

CASE 8. *Fracture through the middle third. Result perfect.*

E. M., aged fourteen years.

After thirty-one years I find it perfect, but Mr. M. says that a projection existed at the seat of the fracture about five years.

CASE 9. *Fracture through the middle third. Result nearly perfect.*

Samuel Chapin, aged five years, fell down a flight of steps and broke his clavicle, at the outer end of the middle third. The fracture was rather more complete than interstitial fractures are usually, the deformity being very manifest, and the projection quite angular and slightly movable.

Assisted by Dr. Barnes, I dressed the fracture carefully with Fox's apparatus, but we could not completely restore the fragments to place, neither at this nor at the subsequent dressings.

The fragments became firm in about twenty days, but a slight deformity remained at the seat of fracture.

CASE 10. *Fracture through the middle third. Result nearly perfect.*

(This fracture occurred in the same person as Case 19, but was not discovered until the twenty-fourth day. No treatment was, therefore, adopted, except so far as the treatment of the fracture in the opposite arm might influence this.)

Wm. Hefferman, aged fourteen years. Fracture of the right clavicle, at the outer end of the middle third. No displacement, and only a slight bend. On the twenty-fourth day this bend was accidentally discovered, surrounded with a distinct and perfect provisional callus. The bone was at this time so firm that it could not be bent by any moderate force applied at its two extremities.

CASE 11. *Fracture through the middle third, resulting in a slight deformity.*

E. A. W., aged twenty-three months. This child fell from her bed, a height of about two feet. The parents did not discover that any injury had been done to the collar-bone until about five days

after the accident. Dr. George Burwell was then requested to see it, and found the same deformity existing as at present, and pronounced it a fracture. On the fourteenth day, at the instance of Dr. Burwell, the child was brought to me. The right clavicle was bent abruptly forwards, at about its middle. The projection was no greater now than on the fifth day, when it was first discovered. She used her arm freely.

We immediately made an attempt to straighten the bone by pressing upon the projecting angle, while, at the same moment, the scapula was drawn forwards. The efforts were repeated, and at each time the pressure made was firm, steady, and long continued. We could, however, produce no change in the form of the bone, and our efforts were discontinued.

No dressings had been previously applied, and I did not advise their application now.

After three years, I have again examined the bone, and find the projection has become smaller, but it is still quite manifest. The functions of the arm are in no ways impaired.

CASE 12. *Fracture through the middle third. Result imperfect.* (See cast in my private collection.)

B., aged seven years, of Rochester, fell and bent her right collar-bone, near its middle. Her parents did not discover the accident until after three weeks, when they immediately brought her to me. The bone was then firm, and by no reasonable pressure could it be made to yield; it was slightly bent forwards at the seat of fracture, and in this condition we were obliged to leave it. I advised no treatment.

CASE 13. *Fracture through the middle third. Result imperfect.* (See cast in my private collection.)

The cast of this case was furnished to me by Dr. Caleb Green, of Homer, N. Y., the very intelligent surgeon who treated the fracture, and I shall take the liberty of quoting his own account of it.

"Dec. 21, 1847, I was called to dress what was considered to be a fractured clavicle, of George Stone, a lad eight years of age. One of his playmates had tripped him in such a manner that he fell on his side, striking on the extremity of the left shoulder. I found that he was unable to raise the hand to the head. On examination, I discovered on the posterior edge of the clavicle, at the inner extremity of the external curvature, a point which was swollen, tender,

and painful. The anterior edge of the clavicle was continuous, and there was neither crepitus nor displacement. Considering the age of the patient, and the appearance of the parts, I diagnosed bending of the clavicle forward with a *splitting out* of the posterior edge, and that the bone, by its elasticity, had resumed its ordinary direction. In order to be safe, however, I dressed the shoulder as for actual fracture of the clavicle, lest the fracture *might* have extended nearly through the bone, and there be subsequent displacement. The swelling subsided in four or five days, and as all seemed secure, I removed the dressings, and heard no more of the matter until the 11th of May, ult., when I was called to see the patient again, and found that he had met, the day before, with precisely the same accident, at the old point, and by the same cause, being tripped down by a playmate. This time the swelling and other symptoms of inflammation were greater than before. The anterior edge of the clavicle was entirely continuous, but he could not raise the arm. I merely directed him to keep to his bed until the swelling and inflammation should in a measure subside. In three or four days he was about. The callus left is not large, still it is quite evident. I have had one well-marked case of bending of the radius and ulna, in a boy eight years of age, and other surgeons have detailed similar accidents to the forearm, and, more rarely, cases of incomplete fracture, with bending of the humerus, leg, and thigh; but as a like bending of the clavicle is much less common than either of the others, I have thought this case possessed sufficient interest to make it worthy of being reported.

CASE 14. *Fracture through the middle third. Result perfect.*

W. P. L., aged thirteen years. The fracture occurred at the outer end of the middle third. Dr. John Thompson, of Scipio, Cayuga Co., N. Y., was employed. Soon after the union had been completed, it was refractured by accident, and it was re-dressed by the same surgeon.

Of the treatment adopted in this case I have no information.

I examined the clavicle thirteen years after the accident, and no trace of the original fracture could be seen.

I believe it proper to assume that this was a partial fracture.

The following case I have thought was of sufficient interest to authorize its introduction at this place, but as some doubt may

exist as to the character of the fracture, I shall not include it in my tables.

Fracture through the middle third. Union with great deformity. (Specimen found in dissecting-room. See cast in my private collection representing the thorax before the bone was removed, and, also, cast representing the bone after it was removed.)

The deformity, as seen before the integuments were removed, was very remarkable—the left clavicle being bent downwards and forwards at a point just two inches and a half from the sternum, and deviating from its proper line about one inch. The patient was an adult.

The bone, on examination, was found firmly united at the point of fracture, but expanded into a sort of round knob, smooth and uniform upon its surface.

I suspect that this fracture occurred in early life, as it was transverse, and its knob-like projection resembled that which is so commonly found to exist for a long time upon any fractures or bendings of the bones in children. The nodose swelling, also, at the seat of fracture, was formed entirely at the expense of the anterior and superior surfaces of the clavicle. Posteriorly and inferiorly, the surface of the bone was only slightly, if at all elevated, and I presume this side of the bone was never completely broken.

It would have been impossible for the ends of a complete fracture of the clavicle, such as occur in adult persons, to have been retained in apposition until union was effected, while at the same time the fragments were so much out of line.

SEC. II.—COMPLETE FRACTURES.

DIVIS. 1.—*Middle Third.*

CASE 15. *Simple oblique fracture. Union with deformity.*

G. W. R., of Lockport, aged about fifty years. While residing temporarily in Buffalo, he fell and broke his left clavicle at the outer end of the middle third. Fracture simple and oblique. Dr. Barnes and myself were employed as his surgical attendants. We found the sternal fragment projecting and overriding the acromial fragment. Before applying any dressings, we attempted to reduce the fragments, so as to determine its practicability, but we did not succeed. Having assured Mr. R. that an overriding would be the result, we applied Fox's apparatus. After the application of the

dressings, reduction still remained impossible. We observed, also, that whether the dressings were applied snugly or loosely, the fragments constantly moved upon each other, whenever he turned his neck or changed the position of the opposite arm.

On the eighth day, the callus around the fragments was very abundant.

On the twenty-first day, motion at the seat of fracture had nearly ceased, and at the end of four weeks the union was completed, but with the usual deformity.

Having been advised, subsequently, by a surgeon, that such a result was unnecessary, and that it implied unskilfulness or neglect on my part, he talked of withholding payment for my services, and this notwithstanding he had been from the first fully warned of the certainty of such a result. Until surgeons learn by their own experience, or from the testimony of others, what may be accomplished after these accidents, they will, no doubt, continue to regard such results as were obtained in this case, as evidence of wrong practice.

CASE 16. *Simple oblique fracture, and union with deformity.* (See cast in my private collection.)

Hugh Sarsfield, aged fifty-seven years; an Irish laborer; fell upon the outside of the left shoulder, breaking his left clavicle. Fracture at the outer end of the middle third. Simple and oblique.

I immediately applied a figure of 8 bandage, with a sling and axillary pad. The fragments were brought nearly to their proper places.

On the two following days the bandages were found slightly loosened, and the fragments displaced.

On the third day I applied a dressing after the method described and recommended by M. Velpeau,* except that I employed flour paste instead of dextrine. The dressing was very carefully laid on, and when completed the fragments were in place, and the patient expressed himself as being quite comfortable.

On the following day he complained greatly of its tightness. On the third day after its application, I found he had himself cut away the principal parts of the bandages, and that the fragments were again displaced. I therefore removed them entirely, and substituted the figure of 8.

* Nouveau Eléments de Médecine Opératoire. Par A. L. M. Velpeau, à Paris, 1839, tom. i. p. 229.

The result has been that the bone has united, shortened about three-quarters of an inch, but the arm is as strong and as useful as before the accident.

CASE 17. *Simple oblique fracture, and union with deformity.*

Baby Golden Condy (female), Irish, aged forty years. By a fall she broke her right clavicle at the junction of the outer with the middle third. Fracture simple and oblique.

On the following day I dressed the fracture with a sling, axillary pad, and bandages. These were removed on the fourth week, when the bone was found united and shortened half an inch.

CASE 18. *Simple oblique fracture, and union with deformity.*

H. M., of Angelica, aged about thirty-five years. Fracture at the outer end of the middle third; oblique, occasioned by the kick of a horse.

Five days after the accident, Drs. Charles and Smith, of Angelica, both men of excellent reputation as surgeons, dressed the fracture with the eleven yard bandage of S. Brown, and with a pad in the axilla.

On the eleventh day from the accident, and six days after the first dressing, Mr. M. himself directed the bandages to be removed. It was done without the knowledge of his surgeons, because, he said, he could not endure the pain. The pain was chiefly on the outside of his humerus, near its middle.

Dr. Charles reapplied the same dressings, but with a smaller axillary pad.

About the twenty-third day, Mr. M. again removed the whole of the dressings, and from this time forward the bandages were several times applied, and as often removed, after a short time, by the patient.

Four months from the date of the fracture, Mr. M. consulted me.

The bone had then united, and with the usual deformity. It was shortened three-quarters of an inch. He could, at this time, raise his arm but slightly from the side of his body.

CASE 19. *Simple oblique fracture, and union with slight deformity.*

Wm. Heffeman, aged fourteen years, was admitted into the hospital with a fracture of the left clavicle, having been run over by a horse and buggy. Fracture at the outer end of the middle third; simple and oblique, with the usual overlappings. He could raise

his arm perpendicularly over his head, as easily as before the accident.

I replaced the fractured ends, and then dressed with a sling under the forearm and elbow, and a well-padded board across the back, to which the shoulders were securely laced. The retention of the fragments was complete.

On each successive day, however, I found the board displaced more or less to the right or left shoulder, and during most of the time the dressings were completely inoperative. Still they were continued with occasional slight modifications, until the cure was consummated.

On the thirteenth day I noticed callus upon the upper margins of the broken ends, but none in front or below. The same was noticed, also, on the twenty-first day, but it was less in amount.

The union was complete about the twentieth day, as motion was perceptible on the eighteenth, and it was lost on the twenty-first. It united with a slight overlapping and projection.

CASE 20. *Simple oblique fracture, and union with deformity.*

Almond D. Loomis, aged twenty-three years, fell, while wrestling, upon his left shoulder, breaking the left clavicle at the outer end of the middle third. Fracture simple and oblique, with the usual displacement. It was shortened one inch.

Assisted by Drs. Thompson and Hunt, I applied a sling with an axillary pad, &c. &c., but we could not retain the fragments in place. We then covered the elevated fragment with long and broad strips of adhesive plaster, which, for a time, brought the bone to its place.

I never saw the patient again, but I have been told that it finally united with the usual deformity.

CASE 21. *Simple oblique fracture, and ligamentous union.*

Edmund Nugent, aged twenty-five years, was admitted to the hospital in March, 1854. The house surgeon called my attention to his clavicle, and in presence of Drs. Winnie, Rochester, and Davis, I made the following examination and notes:—

Nugent is a stout Irish laborer. Sixteen years ago, when only nine years old, he fell from a horse and broke his left clavicle, at the outer end of the middle third. This was near Cork, in Ireland, and without consulting any surgeon or "handy man," he continued at his work, holding the tail of the plough, nor from that day for-

ward did he employ a surgeon, or dress his arm, or cease from his work.

The clavicle presents now the same deformity which nearly all other similar fractures present after what is usually termed successful treatment, except that it is not united by bone. The outer end of the inner fragment rides upon the inner end of the outer fragment half an inch. The ligament uniting the two extremities is so long and firm that it can be distinctly felt, and the fragments may be moved upon each other with great freedom.

In order that we might determine the amount of injury which he had suffered from the ligamentous union, we directed him to lift weights placed on a table before him, while he was seated upon a chair. We ascertained from this experiment that with his left arm he could lift as much, within three ounces, as he could with his right, and he was not himself conscious of any difference. The muscles of the left arm seemed as well developed as those of the right.

CASE 22. *Simple oblique fracture, and union with slight deformity.*

Mary Beaumont, aged seventeen years, broke her left clavicle at the outer end of the middle third. Dr. Brodie, of Caven, C. W., treated the fracture.

Nine years after the accident she became an inmate of the Buffalo Hospital, and was under my care.

The outer end of the inner fragment is displaced upwards about half an inch. There is no shortening. The functions of the arm are perfect.

CASE 23. *Simple oblique fracture, and union with deformity.*

H. B. H., of Gaines, Orleans Co., aged forty-four years, a carriage maker by trade. Health generally pretty good, yet not very vigorous. Mr. H. fell down a flight of steps, about four feet, striking upon his right shoulder, and fracturing his right clavicle at the outer end of the middle third. He was not stunned by the fall, and his right shoulder and side were only slightly bruised.

Dr. Alfred Babcock, of Orleans Co., was employed. He applied a jacket (Brasdor's) with shoulder-straps, and a sling; no axillary pad. The jacket had no purpose except to attach the shoulder-straps, which were buckled over each shoulder. That on the right side was intended to keep down the inner fragment; and it was therefore buckled so tight that he was compelled constantly to in-

cline his head and body to the right side. He was unable to lie down completely, but, most of the time, he half reclined upon his back.

On the twenty-first day, Dr. Babcock removed the dressings, and found the fragments displaced, but united. Dr. B. offered to "break it over again," but the patient declined. The same dressings were reapplied, and continued one week longer.

Two years after the accident, Mr. H. consulted me at Buffalo. The place of union of the broken clavicle was very perceptible; the inner fragment lying entirely in front, and not at all above the outer fragment. It is shortened three-quarters of an inch. A narrow ring of ensheathing callus can be distinctly felt.

Three months after the accident, and about two months after the dressings were removed, the upper dorsal vertebræ began to fall off to the left side. Soon, his left hand became tremulous and weak, and now his left arm and hand are completely paralytic, and his left leg is also partially paralyzed. Sensation remains undiminished. His spine is also very much curved to the left. The right arm is sound, and its strength is in no degree abated. His health is somewhat impaired.

It is not clear what has occasioned the spinal distortion and the paralysis, but I suspect it is due to some injury done to the vertebral column at the time of the accident, although he is not conscious of having received any such injury.

To charge these results to the peculiar mode of dressing the fracture, the facts and circumstances will scarcely warrant.

CASE 24. *Simple oblique fracture, and union with deformity.*

Daniel Sullivan, of Buffalo, aged fourteen years, fell from a scaffolding, striking upon the back of the left shoulder, and breaking the left clavicle at the outer end of the middle third. I first applied Day's splint, and, subsequently, Fox's apparatus, but I soon found that the fragments were only temporarily kept in place by either of these dressings; yet with various modifications, and frequent readjustments, Fox's apparatus was continued throughout the treatment. On the eleventh day the fragments were immovable, and no provisional callus could be felt. The boy was a restless, active fellow, and was incessantly going about.

It has united with the inner fragment riding upon the outer one a quarter of an inch. Three months after the union was effected, the arm was as useful as before. The dressings remained on the arm

about thirty days. As is usual with good-natured people, the mother ascribes the deformity to his own carelessness; she says, "he had the dressings loose nearly all the time."

CASE 25. *Simple oblique fracture, and union with deformity.*

M. W., of Angelica, aged twenty-two years, was thrown from a carriage, breaking her right collar-bone. Fracture oblique, at the outer end of the middle third.

Dr. Haines, of Portage, dressed the fracture immediately, and I met him in counsel on the third day after the accident. The inner fragment was then riding upon the outer in the usual manner. Dr. Haines had attempted repeatedly to restore the fragments to an exact apposition, but he had been wholly unable to do so; nor did we succeed any better after my arrival. We were unable, even for one moment, to bring them into place.

We applied Fox's apparatus moderately tight, and I left the case in the hands of Dr. Haines, with an assurance that overlapping and some deformity must be the result; and I have since learned that such was the fact. It is shortened about half an inch.

CASE 26. *Simple oblique fracture—union not perfect.*

James Elwood, of Rochester, aged thirty-five years. Fracture occurred at the outer end of the middle third: right clavicle. Dr. ——, of Rochester, in attendance.

Five years after the accident, I found the clavicle shortened half an inch, and slightly deformed at the seat of fracture. The right shoulder falls about half an inch; his arm is, however, in all respects as well and as useful as before. It was dressed, he says, by a surgeon in Rochester, but he cannot give the name of the surgeon, nor have I any notes of the mode of treatment.

CASE 27. *Simple oblique fracture, and union with deformity.*

Hiram Gaylor, aged thirty-three years, broke one of his collar-bones at the outer end of the middle third. Dr. Stanberg, of Palentine, Montgomery Co., was in attendance.

Fourteen years after the accident, I found the usual displacement at the seat of fracture, with a shortening of half an inch. The arm has been occasionally painful from that time to the present. Its functions were, however, unimpaired. My notes do not declare the mode of treatment.

CASE 28. *Simple oblique fracture, and union with deformity.*

Mrs. T. M., aged thirty years, was thrown from a carriage, striking upon the outer end of the left acromion process. The left clavicle was broken at the outer end of the middle third, or about two and a half inches from the acromion process.

The outer end of the inner fragment was lifted upwards and forwards, and made to override, very slightly, the acromial fragment. By pressure alone it was easily replaced.

Assisted by my son, Theodore, I adjusted the fragments, and secured the arm with a sling, axillary pad, and bandages.

On the third day, I found the dressings loose, and the fragments displaced, although the usual care had been taken to prevent this result. I removed, therefore, the dressings, and substituted a carefully made Fox's apparatus.

On the seventh day, the patient having been seen by me, and the dressings tightened on each intervening day, I removed the apparatus, finding that it had no influence in retaining the fragments in place, and I substituted a dressing made entirely of adhesive plasters. For this purpose I used, at this single dressing, about two yards of plaster, made into strips of from three to four feet in length by one or two inches in breadth. A pad was placed in the axilla, and the arm and shoulder were then secured by various turns of the adhesive strips, some of which served as a sling for the elbow, some bound the elbow to the body, some drew back the shoulders, and some crossed the broken clavicle to bear down the outer end of the sternal fragment. When the whole was finished, the patient expressed herself as very comfortable, and the fractured ends were in place. The next day, the straps had slipped and loosened, and the fracture was again deranged.

On the thirteenth day, I becamed satisfied that no amount of care and diligence, short of a reapplication of them every few hours, was sufficient to prevent the straps from becoming loose, a circumstance mainly due to the warmth of the body, and to the motions of respiration. I therefore removed the straps, and applied the very beautiful and ingenious splint for fractured clavicles, invented by Mr. Day. This is a carved splint, made to fit the back, shoulders, and neck, and furnished with sling, straps, loops, etc. Before applying this splint, I had a large and soft cushion constructed and placed on the concave surface of the splint. Its application was easy and simple, and promised to be efficient.

The patient wore this apparatus five days, during which time it

required daily, indeed almost hourly, readjustment, as the splint would constantly slide upwards against the neck and head, and the shoulder-straps would roll and excoriate the axilla. To remedy the latter difficulty, I had large circular tin plates constructed, furnished with pads, which were placed in front of the axilla, and over which the shoulder-straps were made to pass. The sliding upwards of the splint, however, still continued, and was irremediable; and, on about the twenty-first day, this also was removed, and no dressings were subsequently employed, except a sling for the forearm. At this time no union had occurred. No provisional callus could be felt; the fragments remained slightly displaced, just as when I first saw her. In short, the treatment had accomplished nothing.

Soon after union occurred, and, two months from the time of the fracture, I found the bone firm, with an overlapping of three-quarters of an inch. The functions of the arm were also already completely restored. At the end of one year, no changes have occurred.

CASE 29. *Simple oblique fracture, and union with deformity.*

John Moran, a sailor, aged twenty years, fell upon his left shoulder, and broke the left clavicle at the outer end of the middle third.

At the end of fourteen days, he consulted Dr. Charles Wilcox, Surgeon to the Marine Hospital at Buffalo. This was his first application for surgical advice. Dr. Wilcox applied the figure of 8 dressing; on the following day, it had become loosened and drawn into strings, and, on the third day, John removed it altogether, and has had no treatment or dressing since, except that he has generally kept his hand in the bosom of his coat.

The bone united in about twenty-one days, and, at the end of six weeks, when I examined it carefully, the clavicle was shortened one-quarter of an inch; provisional callus could be detected. The arm was as strong and as useful as before.

CASE 30. *Simple oblique fracture, and union with deformity.*

Daniel Sharp, æt. 16 years, broke his right clavicle, at the outer end of the middle third. A surgeon of respectability in New York city dressed and treated the fracture.

Seventeen years after the accident, I examined the arm, and found a projection and overlapping of the fragments, to the extent of three-quarters of an inch. Its displacement upwards was rather greater than is ordinarily seen, yet the arm was as strong and as useful as before. Patient cannot describe the treatment.

CASE 31. *Simple oblique fracture, and union with deformity.*

Henry West, aged 25 years, broke his left clavicle at the outer end of the middle third. Surgeon Williams, of Liverpool, England, dressed the fracture, and continued his charge until the cure was completed.

Two years after the fracture had occurred, West came under my care at the hospital. The clavicle is shortened one-quarter of an inch, and a slight deformity remains at the seat of fracture. The functions of his arm are perfect. I have no knowledge of the treatment.

CASE 32. *Simple oblique fracture, and union with deformity.*

James Roach, aged about 40 years. A barrel of flour fell against his left shoulder, breaking the left clavicle at the outer end of the middle third: oblique and simple. The fragments were displaced in the usual manner.

Assisted by Drs. Eastman and Vanderventer, I applied dressings consisting of a sling, axillary pad, and bandages. Over each shoulder I placed a moulded compress, made of numerous layers of cloth and paste; this, when dry, was to serve as a *point d'appui* for bandages, tapes, &c.

The whole being arranged, we made an attempt to reduce the fragments, but we were unsuccessful.

The same thing happened, indeed, which has several times happened to me before. I could not, nor could the gentlemen with me bring the fragments into apposition, and this notwithstanding we placed our knees against the back, and drew forcibly upon the shoulders; and notwithstanding also we placed a firm pad in the axilla, and made use of the arm as a lever until the patient could no longer endure the pain. Each gentleman satisfied himself that it was not practicable to reduce the fragments by either of these modes, and on the following day Dr. Myers, of the U. S. Army, and Dr. Pupikofer repeated the attempt in my presence, and with like success.

In one way alone could the fragments be brought even temporarily into contact, viz: by pressing the acromial end of the sternal fragment downwards and backwards, which fragment we found, when left to itself, constantly projecting upwards and forwards, while the opposing fragment was inclined, at its sternal end, backwards.

The patient was assured that overlapping was inevitable; the

dressings were carefully applied, and, with slight modifications, were continued until the cure was completed.

The fragments united about the thirtieth day, with half an inch of shortening, and with projection of the outer end of the inner fragment.

CASE 33. *Simple transverse fracture, and union without deformity.*

Patrick Rowan, aged 26 years, fell while wrestling, and broke the right clavicle at the outer end of the middle third. The fracture was complete, but transverse.

I reduced the fragments soon after the accident, and noticed that unless disturbed, they would remain in place for a few seconds, at least.

I applied the cross described in Case 21; on the seventh day, motion between the fragments had ceased, and on the twenty-eighth day the apparatus was removed, and the union found to be complete without shortening or deformity.

CASE 34. *Simple oblique fracture, and union with deformity.*

S. E., of Buffalo, aged about 25 years. Mr. E. was thrown upon his shoulder, by jumping from the cars while they were in motion. The fracture was at the outer end of the middle third, simple and oblique.

During the first four days, I applied a figure of 8 bandage with an axillary pad and a sling. Finding, however, that the fragments could not by these means be kept in place, I directed our ingenious instrument maker, Mr. Seiffert, to construct, under my direction, an apparatus such as I hoped might prove more efficient in the management of these fractures. It consisted essentially of an upright and a transverse plate of brass, secured upon each other in the form of a cross, and intended to be placed against the back. The transverse bar extended from acromion to acromion, to which the shoulders were to be securely fastened back by leather shoulder caps and straps, with buckles. This bar was padded, especially along its middle, where it was intended to rest between the blades of the scapulæ. The vertical bar was only designed as a support for the crossbar, its lower end being received into a pocket made in a broad leather belt, the belt to be fastened around the hips.

This apparatus I applied on the fifth day, and I continued to see him daily until the cure was completed. Motion between the fragments had ceased on the fourteenth day after the accident, and

on the twenty-fifth day I removed the apparatus entirely, the bone being quite firm. There was, however, the usual overlapping and deformity at the seat of fracture, but rather less than occurs in a majority of cases.

I cannot say that the apparatus answered my expectations, since it was constantly inclined to fall off from the shoulders, either to the right or to the left, and this defect I have not yet succeeded in remedying.

CASE 35. *Simple oblique fracture, and union with deformity.*

Mrs. ——, of England, aged 28 years, fell and broke her left collar bone obliquely at the outer end of the middle third. A surgeon in London dressed the fracture.

Twelve years after the accident, I found the usual deformity and a shortening of half an inch; the arm in other respects, perfect. No record of treatment.

CASE 36. *Simple oblique fracture, and union with deformity.*

Mary McCarty, aged 12 years, of Ireland. Mary broke one of her collar bones, by a fall upon her shoulder. The fracture was complete, and occurred at the outer end of the middle third. She says that a skilful Swiss surgeon dressed the fracture. Twenty-three years after the accident, she became an inmate of the Buffalo Hospital, and I examined the arm.

The clavicle is shortened half an inch, and slightly bent at the seat of fracture. For many years, Mary says, the deformity was very striking. Functions of arm not impaired.

CASE 37. *Simple oblique fracture, and union with deformity.*

Silas Usher, aged 46 years, fell from a scaffolding about fifteen feet, striking upon his shoulder, and breaking the left clavicle, near the junction of the outer third with the inner two thirds. Dr. Peter Knox, of Watervleit, dressed the fracture immediately, with an axillary pad, sling and bandages. On the third day, the fragments were discovered to be displaced, and Dr. Thorn, of Troy, was summoned.

Dr. Thorn removed the dressings and substituted an apparatus composed of bandages, and without any axillary pad. He also placed an adhesive plaster over the fracture; on the tenth day Dr. Thorn removed all the dressings, and did not reapply them; but the plaster was continued until it fell off.

Eleven years after the fracture, I found the bone united, but overlapped one-quarter of an inch; the inner fragment overriding the outer, the functions of the arm perfect. He thinks it was united in about two weeks after it was broken.

CASE 38. *Simple transverse fracture, occurring at the seat of an old comminuted fracture. Union without additional deformity or maiming. Prosecution of the surgeon, and successful defence.* (See cast in my private collection.)

Burgess, aged about 30 years, of Buffalo, N. Y. (This is the same man whose first fracture is reported in Case 52.) Burgess was riding in a buggy, when the horse became frightened by the passage of a train of cars, and he was thrown upon the ground, striking upon his right shoulder.

Dr. George Burwell, an intelligent and skilful surgeon of Buffalo, was called to dress the fracture.

On the eighth day, Dr. Burwell requested me to see Burgess with him. I found him wearing Fox's apparatus, which had been carefully made and applied, but which was now loose from his own interference. The clavicle was broken at the seat of the old fracture, but only at one point—at the point nearest the shoulder. The vertical or intercepted fragment remained firmly fastened to the inner portion of the bone. Burgess had not told Dr. Burwell, nor did he tell me that the clavicle had ever been broken before, and we did not suspect the intended imposition. We were unable to explain satisfactorily the fixed and immovable condition of the central fragment, which we repeatedly attempted to restore to place. On attempting to adjust the portions which were movable, also, we found that no force applied to the shoulders was sufficient to make any sensible impression upon them. They still continued to occupy almost precisely the position in which we first found them. We assured him, therefore, that deformity was inevitable, and that we would apply the dressings only so as to maintain some degree of rest between the fragments, but that we should not attempt to overcome the shortening, &c. To this Burgess assented with a readiness which at that time surprised us, but which subsequent developments rendered consistent. We observed, also, the emaciated condition of the arm, and the deformity of his hand and wrist. These conditions he ascribed to a dislocation of the shoulder which, he said, occurred when he was twelve years old.

Dr. Burwell continued to attend him until the union of the bone was completed, about twenty-one days.

Soon after his recovery, Burgess commenced his well-planned and systematic conspiracy, by prosecuting the Niagara Falls Railroad Company, for having been the cause of his accident, and of all the deformity and maiming from which he was now suffering.

This suit resulted in a verdict in favor of the company.

A few months later, Burgess refused to pay his bill for surgical services, and threatened to prosecute Dr. Burwell for damages. Dr. Burwell immediately gave the account to his attorney for collection, and Burgess, through Mr. Williams, his counsel, put in a defence of "unskilful treatment." The cause was tried October 3d, 1846, in a Justice's Court, Justice Childs presiding, and when the testimony was partly before the magistrate, Burgess's counsel withdrew the defence, and Dr. Burwell's account was allowed. Burgess, however, had no property, and the judgment was never paid.

The matter did not rest here. He at once commenced a suit against Dr. Burwell for mal-practice. The first trial of this suit occurred in June of 1847, in the Erie County Circuit, Judge Stevens presiding.

The evidence was most conclusive in favor of Dr. Burwell, but the jury could not agree, and were dismissed. Eleven of the jurors wished to return a verdict for the defendant, Dr. Burwell, and one insisted upon damages to plaintiff.

The second trial occurred in June, 1849. The same facts were elicited here as on the two former trials, viz: That he had repeatedly falsified his own statements in relation to the cause of his maiming. That he had at one time ascribed it solely to an injury of the wrist, received when he was twelve years old; at another, to an old dislocation of the shoulder; at another, entirely to his recent accident. He never admitted, so far as we could learn, that the clavicle had ever been broken until recently, but it will be seen at once that, with the knowledge of his character and motives now disclosed, no other supposition is probable. The jury having heard the testimony, promptly returned a verdict for the defendant.

CASE 39. *Simple fracture, and union with very little deformity.*

Francis Carpenter, aged thirty-two years, of Lille, France. Francis fell sideways upon the ground, striking upon the outer end of his left shoulder, and breaking the left clavicle at the outer end of the middle third.

Dr. Barras, of Lille, dressed the fracture with bandages and a sling, using no axillary pad, and no band to draw the shoulders back. The dressings were continued eight weeks.

Ten years after, while an inmate of the Buffalo Hospital, I examined the arm. The clavicle had united without shortening, but only bent forwards at the seat of fracture. He thinks it never overlapped, nor was there ever any sharp projecting point of bone, the arm is as strong as before the accident. Probably it was a transverse fracture, and possibly not complete.

CASE 40. *Simple oblique fracture, and union with deformity.*

Joseph Price, aged about twenty years, broke his clavicle at the outer end of the middle third. Oblique and simple.

I applied Fox's apparatus, but did not see him but once or twice after the first dressing, as he soon left town. Two years from the date of the accident, I examined the arm again. The fragments had united, overlapped, and with the usual deformity. It is shortened half an inch. He is a good-natured fellow, and ascribes all the unfortunate result to his own negligence. His arm is not yet quite as strong as before the clavicle was broken.

CASE 41. *Simple and oblique fracture, and union with deformity.*

C. A. W., aged forty-seven years, was struck by the hawser of a vessel, breaking the right clavicle, and, at the same time, several ribs on the right side of his body. Dr. Sprague, a very experienced surgeon of Buffalo, was called, and applied dressings consisting essentially of a sling and axillary pad, bandages, &c. The condition of his side, however, did not permit the dressings to be applied very snugly.

Some person having suggested to Mr. W. that the arm was not properly in place, that the shoulder was out of joint! and the clavicle not united! he consulted me in June, 1851, about four years after the accident.

The fracture had occurred at the outer end of the middle third, and the inner fragment was still overriding the outer fragment. The clavicle was united, but shortened one inch. The projecting point of the inner fragment was quite sharp and prominent, and occasionally tender and painful. The right humerus is properly in its socket, but the muscles about the joint are atrophied, leaving a flatness upon the outside and behind. In front, there exists rather

an unusual fulness. He is unable to raise his arm to a right angle with his body.

CASE 42. *Simple oblique fracture. Union with deformity, and paralysis of the arm.*

Mrs. ——, aged 51 years, of New York. Mrs. —— was thrown from her carriage, breaking the right clavicle obliquely at the outer end of the middle third. Dr. Congar, of Niagara Falls, dressed the fracture with Fox's apparatus. This dressing was continued three weeks, and was not particularly painful.

At this time, by a change of residence, she became the patient of Dr. J., a very excellent surgeon of Erie County, N. Y. The fragments were found to be overlapped, and Dr. J., with a hope of restoring them to place, applied a figure of 8 bandage, with an axillary pad. During the short time these dressings were continued, the pain was excessive; and, notwithstanding the free use of anodynes, they became wholly insupportable, and were removed at the end of fourteen hours.

Dr. C., of the same county, removed the dressings, and reapplied Fox's apparatus, which, with occasional removals, remained on four weeks longer. In all this time, repeated efforts were made to bring the fragments into place.

Forty-eight days after the accident, she consulted me. The clavicle was then united, and overlapped half an inch. The whole arm was swollen, painful, and very tender, with total inability to move it.

I removed all the dressings, and, during the time she remained under my care, in a private room of the hospital, there was a gradual improvement in the condition of her arm, in respect of swelling and tenderness, but the paralysis did not much abate.

CASE 43. *Fracture and union, with slight deformity.*

Miss A. W. R., of Westfield, Chatauque County, aged 5 years, by a fall broke her right clavicle near its middle. Dr. Jones, of Westfield, dressed the fracture. It was found impossible to retain the fragments in place, although Dr. Jones readjusted them at three separate times. Union occurred, with a palpable deformity, which was still manifest thirty-five years after the accident, when I had an opportunity of examining the bone. The arm, also, during the whole of this period, has been occasionally painful. In all other respects it is well.

CASE 44. *Fracture and union, with deformity.*

John Lewis, of Painted Post, N. Y., aged 32 years, fractured his clavicle near its middle. Simple and oblique. Dr. Hoyt, of Painted Post, was employed.

Eight years after the fracture, I found the clavicle shortened one quarter of an inch, and pushed forward at the seat of fracture. The arm was not as strong as before the accident. I find no mention in my records of the treatment.

CASE 45. *Fracture and union, without deformity.*

S., aged 15 years, fell on the ice, breaking his left clavicle. The fragments were never much displaced. Dr. John Trowbridge, of Buffalo, and myself, in attendance.

We applied at first a back-board splint, which seemed to keep the fragments, for a day or two, very well in place; but, after this date, it was found too troublesome, and we substituted a simple sling.

Five years after the accident, I examined the arm carefully, and find it neither shortened nor displaced. Yet the line of fracture can be distinctly felt. It occurred at the outer end of the middle third, and was oblique.

DIVIS. 2.—*Inner Third.*

CASE 46. *Simple transverse fracture half an inch from sternum. Union without deformity.*

Mrs. Winfield Dunmoody, aged 80 years, fell down a flight of steps, breaking the right clavicle about one inch from its sternal end.

Dr. John Trowbridge, who was in attendance, invited me to see the case on the day following the accident. Motion and crepitus were distinct, but the displacement was very inconsiderable, and scarcely perceptible. We applied no dressings, but directed only that the patient should be kept quiet. The bone united in the usual time, and without either deformity or maiming.

DIVIS. 3.—*Outer Third.*

CASE 47. *Fracture between the coracoid process and acromion. Union, with slight deformity.*

J. H., aged about 21 years, in jumping from the cars while they were in motion, broke his left clavicle at a point between the cora-

coid process and the acromion, viz: about half an inch to the acromial side of the coracoid process. The outer end of the inner or sternal fragment was slightly elevated, and overlapped the acromial about one-quarter of an inch. The displacement and deformity were slight, as compared with those cases in which the fracture had occurred on the sternal side of the coracoid process. Dr. Wilcox and myself in attendance.

We laid across the back a broad, thick plate of gutta percha, previously covered with cotton cloth, and to this, as a back splint, we secured the shoulders. A sling and axillary pad were also used, with bandages. The fragments were very easily brought into place and retained.

The next day I found the dressings loose, and I readjusted them with care. On the sixth day, the whole being loose, the bandages, &c., were reapplied, and he was dismissed for his home, where he came under the care of Dr. Lansing Briggs, of Auburn. Dr. B. continued the dressings, but the bone has united with a slight projection and a shortening of about one-quarter of an inch.

CASE 48. *Simple oblique fracture, and delayed union.*

Michael Connor, aged 55 years, fell from a scaffolding and broke his left collar-bone, about one inch from the acromial end. He was sent immediately to the Bellevue Hospital, New York City. "Dr. Murdock dressed the fracture," says Michael, "with a collar upon my right shoulder, a pad under my left shoulder, and a sling under my elbow." The apparatus was retained upon the arm and shoulder about five weeks.

At the end of six weeks, Michael became an inmate of the Buffalo Hospital, and, upon examination, I found that the fragments were overlapped one-quarter of an inch, and that bony union had not yet taken place. Moving the fragments upon each other, produced an audible click at the seat of the fracture. He could not lift his arm.

DIVIS. 4.—*Comminuted.*

CASE 49. *Union with deformity.*

R. L., aged thirty-three years, was thrown from a horse, and broke his right clavicle in two places. One fracture was at the inner end of the outer third, and the other at a point nearer the sternum.

I was called to dress it on the third day, and, on the fourth day,

I applied Fox's apparatus. I could not, however, retain the fragments in place, nor prevent motion.

On the twenty-second day, one fragment had united, but the other remained loose. I substituted the figure of 8 bandage for Fox's apparatus, and applied a compress, &c., over the fracture.

On about the twenty-eighth day, union was effected throughout, but with overlapping and the usual deformity.

Eight years after the accident, I examined the arm, and find the bone united with a shortening of half an inch. The arm is as strong and as useful as before. The overlapping is in front, and not above.

CASE 50. *Union with deformity.*

——, aged twenty-nine years, of Buffalo, was thrown backwards from a wagon, striking upon his shoulder. I saw the man soon after the accident, and dressed the fracture at my college dispensary. The right clavicle was broken at two points, the intercepted piece being about one inch and a half in length, and considerably displaced. The outer fracture was at the inner end of the outer third of the clavicle.

It was noticed that, contrary to what has been supposed to be the general fact in such cases, he could easily raise his arm and hand to his head, and also, that by no force or art could the fragments be made to resume their places. Fox's apparatus was then applied, and the patient distinctly informed that shortening and deformity were inevitable. I have never seen the patient since.

I have learned, however, that the results which I predicted have occurred. It is shortened about half an inch.

CASE 51. *Union with deformity.* (See cast in my private collection.)

Charles Clarke, of Otisco, aged forty-six years, was thrown from his horse, breaking his left collar-bone at two points, viz: at its middle, and at a point about one inch nearer the sternum.

Dr. Ashbel Searle, of Otisco, was in attendance. Dr. Searle placed the arm in a sling, and secured it with bandages, but used no axillary pad. The dressings were at first exceedingly painful, and Dr. Searle was obliged to loosen them.

The bones united, and, fourteen years after the accident, I examined the arm, and found a very marked deformity in consequence of the displacement of the intercepted fragment. The clavicle is

shortened half an inch. His left shoulder is lower than his right. Functions of the arm perfect.

CASE 52. *Union with deformity, and maiming.* (See Case 38.)

Burgess, aged twelve years, then a resident of London, England. The right clavicle was broken at two points, viz: at the junction of the outer third with the inner two thirds, and also at a point one inch and a half nearer the sternum, the intercepted piece being thrown at right angles with the line of the clavicle, and remaining in that position until bony union was accomplished.

The vertical, intercepted piece projected a little more than half an inch both above and below, and the opposite fragments united with it on its anterior and posterior surfaces. Clavicle is shortened one inch.

I have not been able to ascertain what treatment was adopted by the London surgeon, but the result has been a general marasmus of the arm, inability to lift the arm, and a permanent abduction of the hand to the ulnar side, with flexion of the fingers.

He continued, however, to follow his occupation as a carpenter, shoving the plane more by the motions of his body than of his arm.

CASE 53. *Union with deformity.*

B. L. Derrick, aged about fifty years, a feeble, non-muscular man. Mr. D. fell about fifteen feet, striking upon the back and outer part of the left shoulder. Dr. Smith, of the Army, Dr. Wyckoff, and myself, made the first dressing. The clavicle was broken obliquely at the inner end of the outer third, and also at a point about one inch nearer the sternum. The intercepted fragment was quite movable. The acromial end of the sternal fragment was lifted upwards and carried forwards, and also rode upon the other fragment one inch.

We first attempted to replace the fragments before the dressings were applied, but we could not.

We then placed a very broad and firm gutta percha splint upon the back and shoulders well moulded and covered with cotton cloth. To this we drew back firmly the shoulders, but without effecting an adjustment of the fragments.

We then elevated the elbow and shoulder with a properly constructed sling, suspended from the opposite shoulder. The effect was to approximate and partially conceal in the tissues the project-

ing ends, but a careful examination showed that the riding still continued.

Finally, we adapted a large and pretty firm pad to the axilla, and using the arm as a lever, we attempted to carry out the shoulder. When great force was applied, the fragments moved about three lines, but no force which we could apply was sufficient to carry out the shoulder so as to accomplish exact reduction.

Relaxing, therefore, our efforts, and bringing the arm to that position in which the pressure ceased to be painful, we applied the requisite retentive bandages, and left the patient, assuring him that a shortening was inevitable.

After a few days, I became satisfied that the back splint was insufficient, and only burdensome, and I substituted for the whole dressing a simple figure of 8, with a sling, &c.

The result has been a union, with a shortening of one inch, the same as before any dressings were applied. There is also the usual projection of the fragments.

Fractures of the Clavicle.

INCOMPLETE FRACTURES.

No.	Age when it occurred.	Time since it occurred.	Sex.	Character of fracture.	Right or left side.	Point of fracture.	TREATMENT.	RESULT. United or not.	When united.	Amount of shortening.		Perfect or imperfect.
1	4 y'rs	8 y'rs	F.	Simple and trans.	R.	Outer third	Fox's apparatus	United		No shortening.	Cannot trace the fracture	Per.
2	19 "	10 "	"	"	L.	Inner third	Fox's apparatus	"		"	Slight projection in front	Imp.
3	3 "	7 mo's	"	"	R.	Middle third	Handkerchief sling	"		"	Slight projection at time of death	"
4	6 "	5 y'rs	M.	"	L.	"	Surgeon employed, but no treatment adopted	"		"	No trace of the fracture	Per.
5	12 "	6 "	"	"	R.	"	Sling and supine position	"		"	No trace of the fracture	"
6	12 "	6 "	"	"	L.	"	Sling and supine position	"		"	No trace of the fracture	"
7	2 "	24 "	"	"		Middle	Surgeon employed, but treatment unknown	"		"	Cannot determine the point of fracture	"
8	14 "	31 "	"	"		"	Unknown	"		"	A projection existed at seat of fracture about five years, but it has now entirely disappeared	"
9	5 "		"	"		Mid. 3d	Fox's apparatus	"	20 d'ys	"	Slight projection	Imp.
10	14 "	4 w'ks	"	"	R.	"	No treatment, but rest	"	21 "	"	At the end of four weeks there was a slight projection	
11	2 "	3 y'rs	F.	"	"	Middle	Unsuccessful attempts to straighten the bone on the 5th and 14th days. No other treatment	"	14 "	"	Slight projection	"
12	7 "	2 w'ks	"	"	"	"	Not seen by a surgeon until the 14th day. No treatment	"	14 "	"	Slight projection on the 14th day	
13	7 "	6 mo's	M.	"		Outer third	"Dressed as for a complete fracture"	"		"	Slight projection	"
14	13 "	13 y'rs	"	"		Middle third	Surgeon employed, but treatment unknown.	"		"	No trace of the fracture	Per.

COMPLETE FRACTURES.

MIDDLE THIRD.

15	50 y'rs	2 y'rs	M.	Simple and ob.	L.	Outer end of middle third	Fox's apparatus	United.	24 d'ys	¼ inch	Inner fragment projects forwards and upwards	Imp.
16	57 "	1 "	"	"	"	"	Figure of 8. Velpeau's bandage	"		¾ inch	Inner fragment projects. Arm as strong as before	"
17	40 "	5 w'ks	F.	"	R.	"	Sling; axillary pad, &c.	"	28 "	½ inch		"
18	35 "	4 mo's	M.	"		"	Brown's bandage; axillary pad, &c. &c.	"		¾ inch	Considerable projection of inner fragment. Inability to lift the arm	"
19	14 "	4 w'ks	"	"	L.	"	Back splint; sling; no axillary pad	"	20 d'ys	½ inch	(Could lift his arm above his head before it was dressed.) Fragments project slightly	"
20	23 "	1 y'r	"	"	"	"	Sling, &c.	"			Fragments override	"

Fractures of the Clavicle.—Continued.

No.	Age when it occurred.	Time since it occurred.	Sex.	Character of fracture.	Right or left side.	Point of fracture.	TREATMENT.	RESULT.				
								United or not.	When united.	Amount of shortening.		Perfect or imperfect.
21	9 y'rs	16 y'rs	M.	Simple and oblique	L.	Outer end of middle third	No treatment	United by ligament		⅛ inch	Fragments move freely upon each other. No impairment of functions of arm	Imp.
22	17 "	9 "	F.	Simple and trans.	"	"	Treatment unknown	United		None	Fragments displaced in direction of diameter of bone half an inch	"
23	44 "	1 "	M.	Simple and oblique	R	"	Brasdor's jacket; sling; no axillary pad	"	21 d'ys	¾ inch	Paralysis of arm; curvature of spine, &c.	"
24	14 "	3 mo's	"	"	L.	"	Day's splint. Fox's apparatus	"	11 "	¼ inch	Fragments ride, but do not project much	"
25	22 "	4 "	F.	"	R.	"	Fox's apparatus.	"		⅛ inch	Slight projection	"
26	35 "	5 y'rs	M.	"	"	"	Treated by a surgeon, but treatment unknown	"		⅛ inch	Right shoulder falls. Arm as useful as before	"
27	33 "	14 "	"	"			Treated by a surgeon, but treatment unknown	"		⅛ inch	Arm occasionally painful	"
28	30 "	1 "	F.	"	L.	"	Fox's apparatus; adhesive plaster dressing; Day's splint, with axillary pad, &c.	"	26 "	¾ inch	Projection of inner fragment. Functions of arm perfect	"
29	20 "	6 w'ks	M.	"	"	"	Fox's apparatus during three days, and after third day no treatment	"	21 "	¼ inch	Arm as useful as before. No more projection than is usually found	"
30	16 "	17 y'rs	"	"	R.	"	Surgeon employed, but treatment unknown	"		¾ inch	Remarkable projection of inner fragment. Functions of arm perfect	"
31	25 "	2 "	"	"	L.	"	Surgeon employed, but treatment unknown	"		⅛ inch	Slight projection. Functions of arm perfect	"
32	40 "	2 mo's	"	"	"	"	Sling; paste compresses; axillary pad, &c.	"	30 "	⅛ inch	Projection of inner fragment	"
33	26 "	4 w'ks	"	Simple and trans.	R.	"	Back splint; sling; no axillary pad	"	7 "	Not any	Line of bone perfect	Per.
34	25 "	2 mo's	"	Simple and oblique		"	Back splint; sling; no axillary pad	"	14 "	¼ inch	Slight projection	Imp.
35	28 "	12 y'rs	F.	"		"	Surgeon employed, but treatment unknown	"		⅛ inch	Slight projection at seat of fracture. Functions of arm perfect	"
36	12 "	23 "	"	"		"	Surgeon employed, but treatment unknown	"		⅛ inch	Slight bend at seat of fracture. For many years the deformity was much greater. Functions perfect	"
37	46 "	11 "	M.	"	L.	"	Bandages; adhesive straps; no axillary pad	"	14 "	¼ inch	Slight projection. use of arm perfect	"
38	30 "	1 "	"	Simple and trans.	R.	"	Fox's apparatus	"	21 "		This was a second fracture at the same point. The original deformity was not increased. (See case 52.) Prosecution	
39	32 "	10 "	"		L.	"	Sling; bandages; no axillary pads	"		Not any	A slight forward displacement	
40	20 "	2 "	"	Simple and ob.			Fox's apparatus	"		⅛ inch	Slight impairment of strength	"

Fractures of the Clavicle.—Continued.

No.	Age when it occurred.	Time since it occurred.	Sex.	Character of fracture.	Right or left side.	Point of fracture.	TREATMENT.	RESULT. United or not.	When united.	Amount of shortening.		Perfect or imperfect.
41	47 y'rs	4 y'rs	M.	Simple and oblique	R.	Outer end of middle third	Sling; bandages; axillary pad, &c.	United		1 inch	Considerable projection of inner fragment. Use of arm impaired, &c. &c.	Imp.
42	51 "	3 mo's	F.	"	"	"	Fig. of 8; Fox's apparatus; axillary pad, &c.	"		½ inch	Projection of fragments, paralysys, and swelling of arm	"
43	5 "	35 y'rs	"	Simple	"	"	Surgeon employed, but treatment unknown	"			Slight projection; occasionally painful	"
44	32 "	8 "	M.	Simple and oblique		"	Surgeon employed, but treatment unknown	"		¼ inch	Slight projection. Arm not as strong as before	"
45	15 "	6 "	"	"	L.	"	Back board splint, &c.	"			No deformity	Per.
							INNER THIRD.					
46	80 y'rs	2 mo's	F.	Simple and trans.	R.	One inch from sternum		United		Not any		Per.
							OUTER THIRD.					
47	21 y'rs	1 y'r	M.	Simple and trans.	L.	Outside of coracoid process	Gutta percha back splint	United		¼ inch	Inner fragment projects slightly	Imp.
48	55 "	6 w'ks	"	Simple and oblique	"	One inch from acromion process	Fox's apparatus	Delayed 6 w'ks		¼ inch	Unable to lift his arm	"
							COMMINUTED.					
49	33 y'rs	8 y'rs	M.	Commin. and oblique	R.	Inner end of outer third and middle	Fox's apparatus; fig. of 8, &c.	United	22 and 28 d'ys	½ inch	Use of arm not impaired	Imp.
50	29 "	1 "	"	Commin.	"	"	Fox's apparatus	"		½ inch	He could raise his arm to his head before it was dressed	"
51	46 "	14 "	"	"	L.	Middle, and one inch nearer sternum	Sling, &c. No axillary pad	"		¼ inch	Remarkable deformity. Shoulder falls. Functions of arm perfect.	"
52	12 "	18 "	"	"	R.	Inner end of outer third, and 1½ inches nearer sternum.	Employed a surgeon, but treatment unknown	"		1 inch	Wasting and palsey of arm. Contraction of hand and fingers	"
53	50 "	3 "	"	"	L.	"	Gutta percha back-splint; fig. of 8, etc.	"		1 inch	Inner fragment projects	"

REMARKS.

"Yet it is lamentable, even at the present day, to see how some *fashionable* doctors torment their patients, in cases of fracture of the clavicle, with tight bandages, which, after all, have little or no power in keeping the bones *in situ*."—Note to *Works of Hippocrates*, Sydenham Society's ed., vol. ii. p. 585.

I have found it convenient to divide fractures of the clavicle into "Incomplete" and "Complete," and again to arrange complete fractures under several heads, according as they may be simple or comminuted, or as they may have occurred through the middle, inner or outer thirds.

Boyer denied the existence of the incomplete or partial fracture, and calls it "an occurrence utterly impossible." (*Boyer on Bones*, Amer. ed., vol. i. p. 17, 1805.) But Boyer had reference, no doubt, to what has been called sometimes a partial fracture in *adult* bones, and not at all to that accident which we are now considering.

Meding, Turine, Dupuytren, Malgaigne, South, Chelius, Syme, Miller, B. Cooper, Norris, Barton, Gibson, with others, recognize its existence, and no one, perhaps, at the present day, doubts its possibility. J. Rhea Barton, of Philadelphia, has also written upon this subject a very interesting memoir, entitled, "Remarks on certain Injuries of the Bones in Children." (See *Philadelphia Medical Recorder*, vol. iv. p. 13, 1821.)

Fergusson compares it to the fracture of a "walking stick;" South to the cracking of a "fresh willow," but it is more generally known as the "green stick" fracture.

It is necessary, I think, to admit at least two forms or degrees of incomplete fractures, the first of which is unaccompanied with any lesion of the periosteum, and the second is attended with this additional circumstance. A "refinement" which, I ought to say, Mr. Erichsen thinks unnecessary.

I am disposed, however, not only to admit these divisions, but even to extend them, and to regard interperiosteal fractures as existing in three conditions. First, as a mere bend, in which the fibres upon the one side are compressed, and upon the other side expanded, without any actual disruption, except what may be interstitial, and too trivial to be reckoned. Second, as a fracture of the central fibres of the bone, while the outer, more completely cartilaginous and more elastic fibres, preserve their integrity, a condition which M. Blandin claims to have first explained, and which he considers, without sufficient reason, it seems to me, as the sole cause why, in

partial fractures, the fragments do not separate. Third, as a fracture of the middle and outer fibres, generally upon one side only, but within the periosteum.

It is certain that these several injuries do occur; the bone being sometimes merely bent, as happens most frequently in infancy. In such cases, the bone will often resume its form spontaneously, as does the twig of willow after having been bent upon itself. I have reported seven of these cases, and the oldest patient was ten years, while of the second and third variety the oldest child was fourteen years.

Since, however, they possess this feature in common, namely, that the periosteum is not broken, and there are, consequently, no abrupt angles or sharp spiculæ pushing out at the seat of fracture, but only a smooth, knuckle-like projection, it is proper to speak of them as one form.

In the other form of incomplete fracture, the periosteum yields more or less, and a thin fragment of the outer fibres of the bone may be made to fly off from the point of fracture, as in Case 13. Or it may break transversely to its diameter (as occurs most frequently), but not completely across. No crepitus can, therefore, be discovered, unless, by imprudent efforts to examine or to straighten the bone, it should be entirely separated, and then at once both crepitus and displacement will be manifest. To this form of accident belong Cases 2, 9, 13, and 14, the oldest of which patients was nineteen years.

Unlike complete fractures of the clavicle, a considerable proportion of these occur rather to the sternal side of the middle, and they are seldom oblique.

The direction of the displacement is usually forwards and a little downwards. It will be observed, however, that the amount of displacement existing in a bone broken in this way, and for some time united, cannot always be measured by the amount of anterior projection at the seat of fracture, since in Case 3, as well as in Case 13, reported to me by Dr. Green, and I think, also, in several other cases which have come under my observation, the line of the axis of the bone is completely restored, and there exists only a node-like projection in front, with no corresponding depression behind, indicating, as Dr. Green has very properly suggested, one of those fractures in which the bone has been for the moment bent forwards, but has also immediately, in consequence of its elasticity, resumed its original position. The projection, which is soon after found to exist,

is probably, therefore, an effusion under the periosteum—a callus. This may explain, also, why, in some instances, the parents do not discover the fracture until after several days, in one instance, Case 11, not until after five days, and in Case 12, not until after three weeks. There was at first no deformity, because no effusion had yet occurred.

Fig. 3.

Incomplete Fracture. Case 12.

Even in those cases where the bone remains bent, most, if not all of the callus will be found in front, or in the direction in which the bone has yielded. This was very marked in the specimen obtained from the dissecting-room,* where the angular deviation was extraordinary, but there was no callus behind the point of fracture. A circumstance which may so easily mislead us as to the amount of actual bending, ought not to be forgotten.

The prognosis in these simple accidents is generally very favorable. Where the bone is broken, but has by its own elasticity resumed its former position, the deformity, depending only upon the presence of callus, will sooner or later disappear, yet not entirely, I think, until after several months or even years. Where the fracture is a little more complete, and the fragments are not immediately restored spontaneously, the restoration can sometimes be accomplished with ease by moderate pressure upon the projecting point, but this only when the case is early presented to the surgeon, and not always

* This case follows Case 14, but it is not included in the tables, or in the general enumeration.

even then, as some of my cases have proven. In partial fractures of the bones of the forearm, occurring in children, I have not experienced much difficulty in straightening the bones at any time within a week or two, but the same observation will not hold good with regard to the clavicle. The forces cannot be so conveniently applied, and its repair and consolidation are much more rapid.

I agree with Syme, that, in cases of partial fracture, whether it occurs in the clavicle or elsewhere, when the fragments are once restored, mechanical support will hardly be required; at least only in a few cases. If, however, such support becomes necessary, the treatment ought to be essentially the same as for complete fractures.

The division of complete fractures of the clavicle, according as the accident occurs through the inner, outer, or middle third, has been adopted for the convenience of prognosis. By the outer third, I mean all that portion of the clavicle included between its scapular extremity and the internal margin of the conoid ligament, be it more or less than one-third. The remaining portion is intended to be divided equally into two separate thirds. The peculiarities of these several portions, in respect of anatomical relations, liability to fracture, results, &c., will explain the propriety of the divisions.

Fractures which are *complete* occur mostly after the bones have become firm and unyielding. They are also generally oblique, seldom comminuted, still more rarely compound. The point of a bone at which a complete fracture usually occurs, is at or near the outer end of the middle third, and a little to the sternal side of the coraco-clavicular ligament. It might be more exact to say that the fracture *commences* usually at this point, and from thence extends, more or less obliquely, downwards and inwards towards the sternum, the entire length of the fracture, including, sometimes, nearly one-third of the bone.

Bransby Cooper, Miller, Liston, Fergusson, and many others, have spoken of this fracture as occurring most frequently at about its "middle," and in the last American edition of *Fergusson's Surgery*, is a plate, intended, I suppose, to indicate the point where the fracture usually takes place, and it is here represented as a little to the sternal side of the centre. The fact is, however, that it generally gives way at what Syme calls "the beginning of the acromial curvature," and near the junction of the outer third with the inner two-thirds.

Why the bone should break more frequently at this point, especially in the adult, it is not difficult to understand. It is smaller

here than elsewhere, and less supported by muscular and ligamentous attachments. At this point, also, the axis of the bone begins pretty abruptly to curve forwards, more abruptly in the adult and male than in the child and female.

When, therefore, a blow is received upon the point of the shoulders—and it is in this way, by a *contre coup*, that the fracture most frequently occurs—the force of the blow conveyed through the outer portion of the clavicle is suddenly arrested, and expends itself upon the point where the direction of the axis is changed.

Of 48 simple fractures of the clavicle recorded by me, 40 have occurred through the middle third, and a great majority, about 35, at the acromial end of this third; and of 58 fractures, including the incomplete and comminuted, which latter are always broken twice, 39 have occurred at or near this point.

The direction of the displacement is almost always such, that the inner end of the outer fragment is depressed, and falls below the outer end of the inner fragment. It is also found often a little behind the inner fragment.

Syme has seen a case in which the outer fragment overrode the inner; and M. Gueretin reports another case, in the *Presse Médicale*. Hippocrates also speaks of this accident as known to him. Desault saw several cases, and has recorded one. (*Treatise on Fractures and Dislocations*, Amer. ed., p. 16.)

An overlapping and consequent shortening of from one-quarter of an inch to one inch, is almost always present in oblique fractures, occurring at the outer end of the middle third, and not unfrequently in fractures occurring at other points, and in transverse fractures.

A double fracture, or a simultaneous fracture, occurring in both clavicles, seldom occurs. I have recorded two cases (*four fractures*, three of which are incomplete), both occurring in young boys. (Cases 5, 6, 10.)

Malgaigne says it has only happened to him to see it once in 2,358 cases, at the Hôtel Dieu, and he can recollect only five other examples. And of 158 cases of broken clavicles reported from the New York Hospital, it is stated to have occurred in only four. These gentlemen, however, only report hospital cases, and they have reference, doubtless, to complete fractures. Incomplete fractures are not so likely to be seen in such institutions, but are more common, I suspect, in private practice.

Prognosis in this fracture deserves especial attention. In no other

bone, except the femur, does a shortening so uniformly result. Of 39 complete fractures, only 7 have united without shortening; and of 25 simple, oblique, complete fractures, which have occurred at or near the outer end of the middle third, only one has united without any shortening (Case 45); and in this case the patient was but fifteen years old, and the fragments were never much displaced, nor can I say that the treatment had anything to do with the result. Three cases of complete *transverse* fracture, occurring at the same point, have united without shortening.

The shortening varies from one-quarter of an inch to one inch, and the fragments are almost always found lying in the position in which we have described them to be at the first—the outer end of the inner fragment being above, and often a little in front of the outer: sometimes, especially in lean persons, and when the fracture is very oblique, presenting a sharp and unseemly projection.

Fig. 4.

Complete Fracture. Case 16.

The presence of a small amount of ensheathing callus soon after the cure is completed, sometimes increases the deformity. It is rarely seen to encircle the bone completely, but, if present, it is usually most abundant in the direction of the salient points of the fracture, that is, above and below; so that, unless the examination is made with care, the projecting points of callus which remain, sometimes after many years, may be easily mistaken for an intercepted fragment turned at right angles to the axis of the bone. In

the case of partial fracture, reported by Dr. Green, a similar circumstance was observed, but which his natural shrewdness soon enabled him to explain.

Complete fractures through the sternal third of the bone are exceedingly rare, and I have been able to record, from my own observation, but one case, which occurred in an old lady, eighty years of age. The fracture was within half an inch of the sternum, transverse, and it united without any dressings, and without deformity. The rhomboid ligament must, in such accidents, generally prevent any considerable displacement.

It is not quite so rare to find a complete fracture through the acromial third of the clavicle, or through that portion beginning at the acromion process, and terminating at the sternal margin of the internal fasciculus of the coraco-clavicular ligament.

I have recorded two cases, in both of which a slight riding, about one-quarter of an inch, has resulted; and in one, the union was delayed at least beyond six weeks. The deformity, or projection, was in both cases very trifling.

Comminuted fractures have been observed by me five times. The intercepted fragment generally falls off from the line of the other fragments, and cannot easily be restored. I have never seen a com-

Fig. 5.

Comminuted Fracture. Case 52.

pound fracture of the clavicle, although the outer end of the inner fragment often projects in such a way as to excite a serious apprehension that it will push through the skin.

The clavicle usually unites with great rapidity, generally within twenty days. In one instance (Case 33), a transverse fracture, the union seemed to be tolerably firm at seven days. Wallace reports one case from the Pennsylvania Hospital, which was cured in eight days, and another in nine days (*Amer. Med. Journ.*, vol. xv. p. 115). Velpeau says the clavicle will unite in from fifteen to twenty-five days; Benjamin Bell, in fourteen.

I have only once seen a case of ligamentous union (Case 21), and in one other instance, already referred to, union was delayed at least six weeks.

It is seldom that the arm suffers any serious ultimate injury, whatever may be the mode of union. This is most remarkably confirmed by the instance of ligamentous union, in which the functions of the arm are very little, if at all, impaired. Chelius, however, quotes a case of artificial joint of the clavicle where "the use of the limb was not destroyed, but impaired." (*Op. cit.*, vol. i. p. 603.) The paralysis in Case 23 was not due certainly to the fracture, nor is it probable that it was due to the treatment, but only to some injury entirely foreign to the fracture. In Case 42, also, no paralysis existed previous to the repeated attempts which were made to overcome the riding of the fragments. I have no censure for the excellent surgeon who sought thus to accomplish an end so desirable. He was attempting to do only what others claimed to have done in similar cases, and with the same apparatus. A failure, therefore, was certain to bring discredit upon his skill, or to subject him to the charge of not having employed proper diligence and care in the use of the means at his command. But it has added another instance to that mentioned by Dr. Parker, in which the use of the axillary pad has resulted in at least temporary paralysis of the arm, and to this class, also, probably belongs the case treated by Desault himself, and reported by Bichat, in which the paralysis began only on the third day, and was complete on the seventh. How many more the records of private or hospital surgery, if carefully examined, might show, I cannot tell. In Case 38, where the bone had been previously comminuted, a paralysis existed, but whether it was due to the severity of the original injury or to the treatment, could not be satisfactorily learned. Mr. Earle has recorded a case in which the clavicle was comminuted, and the "nerves converging to form the axillary plexus" were so injured that paralysis of the arm ensued. (Samuel Cooper's *Surg.*, Amer. ed., vol. ii. p. 323.)

In a case where conclusions must be drawn so mortifying to our professional pride, it is but fair that the writer should be permitted to defend the value of his evidences by a reference to the opinions of other practical surgeons.

"Great difficulty has been experienced in treating this fracture." (Syme's *Principles of Surgery*, p. 266, Philadelphia ed., 1832.)

"The indications of treatment are plain, but, unfortunately, not very easily fulfilled." (Miller's *Practice of Surgery*, 3d Amer. ed. from 2d Edinburgh, p. 309.)

"Fractures of the clavicle will often cause greater trouble than those which are considered of a more serious character, and the utmost pains will not, on all occasions, suffice to prevent a slight prominence of the inner fragment." (*Practical Surgery.* By Wm. Fergusson. 4th Amer. ed. from 3d London, p. 215.)

"Setting of this fracture is easy, yet only in very rare cases is the cure possible without any deformity." (*System of Surgery.* By J. M. Chelius, of Heidelberg, with notes by South. 1st Amer. ed., vol. i. p. 603.)

"It is considered, also, that the close union of the fracture of the collar-bone depends less on the apparatus than on the position and direction of the fracture; (therefore, in spite of the most careful application of this apparatus, some deformity often remains.") (*Ibid.*, p. 605.)

The following statements of M. Velpeau are found in a letter addressed to the editor of the *Boston Medical and Surgical Journal*, by J. Willis Fisher, dated Paris, Sept. 16, 1846.

Mr. Fisher remarks that the report is drawn in part from his own notes, and partly from "the report published in the *Gazette des Hôpitaux.*" It is the annual summary of M. Velpeau's practice at La Charité, for the year ending Sept. 1846.

"The fractures of the clavicle, less numerous than ordinarily, have been only four. They have proved these three often repeated propositions: First, that contrary to the general opinion, the patients can carry the hand to the head when they have a fractured clavicle. Secondly, that the consolidation of the bone demands only from fifteen to twenty-five days, and not six weeks or two months. Thirdly, that with all the bandages imaginable, we cannot prevent fracture of the two internal and oblique thirds from leaving a deformity." (*Bost. Med. and Surg. Journ.*, vol. xxxv. p. 212.)

"Fracture of the clavicle is almost always followed by deformity,

whatever may be the perfection of the apparatus and the care of the surgeon." (*Vidal* (*de Cassis*). Paris ed., vol. ii. p. 105.)

"Hippocrates has observed that some degree of deformity almost always accompanies the reunion of a fractured clavicle; all writers since his time have made the same remark; experience has confirmed the truth of it." (*Treatise on Fractures and Luxations.* By P. J. Desault. Edited by Xav. Bichat, and translated by Charles Caldwell, M. D. Philadelphia, 1805, p. 9.)

"The venerable gentleman who stands at the head of American surgery, and whose manipulations with the roller approach very nearly to the limits of perfection, informed us, in 1824, that he *had never seen a case of fractured clavicle cured by any apparatus, without obvious deformity.*" (Reynel Coates, *Amer. Med. Journ.*, vol. xviii. p. 62. Old series.)

I need not say that the "venerable gentleman" to whom Dr. Coates refers in this passage, was the late Dr. Physick, of Philadelphia.

If evidence were needed beyond that which has been furnished, of the difficulty of bringing to a successful issue the treatment of this fracture, it might be supplied, one would think, by a reference merely to the immense number of contrivances which have been at one time and another recommended.

A catalogue of the names only of the men who have, upon this single point, exercised their ingenuity, would be formidable, nor would it present any mean array of talent and of practical skill. Such are the names of Paulus Ægineta, Petit, Duverney, Boyer, Boettcher, Desault, Ledran, David, Moscati, Dupuytren, Ravaton, Cruveilhier, Lasere, Delpech, Flamant, Reynaud, Meyer, Mayor, Meslier, Glaucius, Kluge, Heister, Evers, Brunninghausen, Wilhelm, Eberl, Brefeld, Eicheimer, Koppenstaedter, Brasdor, Earle, Chapman, Keal, Ellis, Lee, Amesbury, Wattman, Hancock, Coates, Fox, Brown, Hunton, Day, Keckerly, Guillou, Cabot, Coleman, Bartlett, Welch, &c.

All these surgeons, however, have admitted the same indications of treatment, viz: That in order to a complete restoration of the outer fragment, which alone is supposed to be much displaced, we are to carry the shoulder upwards, outwards and backwards. But as to the means by which these indications can be most easily, if at all accomplished, the widest differences of opinion have prevailed; and in the debate it may be seen that while on the one hand no invention has wanted for both advocates and admirers, on the other hand, no method has escaped its equivalent of censure.

Hippocrates, Celsus, Dupuytren, and others simply directed the patients to lie upon their backs, with the spinal column so supported and lifted with pillows, as that the shoulders would, by their own weight, fall backwards; and from the account given by Dr. Lente, it may be inferred that a similar plan is generally adopted in the New York City Hospital. "But this result (deformity) rarely happens when the patient has strictly followed the directions of the surgeon, as to position especially, for it is by position more than by any other remedial means, that a good result is to be effected. * * * The persevering continuance of the supine position in bed, with the head low, and, if necessary, a pad between the shoulders. This is the treatment uniformly adopted by Dr. Buck, in the hospital, and the results of his treatment are certainly such as to recommend it highly." (*Lente.*)

Nearly the same method we find recommended by Alfred Post, in 1840, then one of the surgeons of that hospital; the arm being merely kept in a sling and bound to the side with the patient lying upon his back; and Dr. Post mentions a case treated in this manner which terminated with very little deformity. (*N. Y. Journ. Med.*, vol. ii. p. 266.)

Albucasis, Lanfranc, Guy de Chauliac, Petit, Parr, Syme, Skey, Brunninghausen, Parker, and very many others, especially among the English, have preferred, in order to carry the shoulders back, a figure of 8, while Desault, Colles, South, Samuel Cooper, have represented this bandage as useless, annoying, and mischievous.

Heister, Chelius, Miller, Brefeld, Keckerley, prefer for this purpose, some form of back-splint, extending from acromion to acromion, against which the shoulders may be properly secured. Parker says that splints of this kind, with a figure of 8 bandage, are "better than all the apparatus ever invented." While Mr. South gives his testimony in relation to all dressings of this sort, as follows: "I do not like any of the apparatus in which the shoulders are drawn back by bandages, as these invariably annoy the patient, often cause excoriation, and are never kept long in place, the person continually wriggling them off to relieve himself of the pressure." (*Note to Chelius*, vol. i. p. 605.)

Fox, Desault and others bring the elbow a little forwards, and then lift the shoulder upwards and backwards. Wattman carries the elbow still further forwards, so as to lay the hand across the opposite shoulder, while Guillou carries the hand and forearm *behind* the patient, and then proceeds to lift the shoulder to its place.

Thus Desault, Fox, and Wattman accomplish the indication to carry the shoulder back, by lifting the humerus while the elbow is in *front* of the body, and Guillou accomplishes the same indication by lifting the humerus when the elbow is a little *behind* the body. Chelius, also (vol. i. p. 603), says: "The elbow, as far as possible, is to be laid backwards on the body."

Sargent, who believes that with Fox's apparatus "the occurrence of deformity is the exception," and not the rule, and prefers it to all others, has treated three cases by Guillou's method, and is perfectly satisfied with its operation. (*Note to Miller's Practice*, p. 311.)

Hollingsworth has also treated one case successfully by Guillou's method, and adds his testimony in its favor. But how shall we explain these equal results from opposite modes of treatment? Is the indication to carry the shoulders back, which Fox sought to accomplish by pressing the elbow upwards and backwards, as easily attained by pressing the elbow upwards and forwards? Or are we not compelled to infer that there has been some mistake as to the precise amount of good accomplished by the apparatus in either case? Moreover, Coates, Keal, and others, instruct us that the only safe and proper position for the humerus is in a line with the side of the body, and that it must neither be carried forwards nor backwards.

Paulus Ægineta, Boyer, Desault, Pecceti, Liston, Fergusson, Samuel Cooper, Erichsen, Miller, Skey, Fox, Smith, Norris, Sargent, recommended an axillary pad, while Richerand, Velpeau, Dupuytren, Benjamin Bell, Syme, deny its utility, or affirm its danger. Dr. Parker has seen one patient in whom paralysis of the arm resulted from the pressure upon the brachial nerves, in the attempt "to *pry* the shoulder out"—(Samuel Cooper's *Surgery*, with notes by Parker, vol. ii. p. 328), and I have myself recorded another.

Desault's plan, which took its origin, as Velpeau thinks, in the spica of Glaucius, under various modifications, is recommended by Delpech, Cruveilhier, Lasere, Flamant, Samuel Cooper, Fergusson, Liston, Cutler, Physick, Coates, and Gibson; while by Velpeau, Syme, Colles, Chelius, Samuel Cooper, and Parker, it is regarded as inefficient and troublesome. Says Mr. Cooper: "In this country, many surgeons prefer Desault's bandages; but I do not regard them as meeting the indications, and consider them worse than useless." (*Op. cit.*, vol. ii. p. 328.)

The dextrine bandages, or *apparatus immobile*, of Blandin, Vel-

peau, and others, constitute only another form of the bandage dressing of Desault.

The sling, in some of its forms, is employed by Richerand, Huberthal, Colles, Miller, Fox, Smith, Sargent, Norris, Neil, Benjamin Bell, Bransby Cooper, Earle, Chapman, Keal, and by a large majority of the English surgeons; while Dr. Gibson declares the *sling* bandage employed so much by the English, "the most inefficient, contemptible, and injurious of all contrivances for such purposes."

No apparatus, perhaps, has been so generally employed, among American surgeons, as that form of the sling introduced by Dr. George Fox into the Pennsylvania Hospital in 1828, since which time no other has ever been used in that institution for the treatment of broken clavicles.

Sargent says of it: "Fractures of the clavicles, treated by this apparatus, are daily dismissed from the Pennsylvania Hospital, and by surgeons in private practice, cured without perceptible deformity." (*Sargent's Minor Surgery*, p. 180. 1848.)

Norris, in a note to *Liston's Practical Surgery*, affirms that "the chief indications in the treatment of fracture of the clavicle are *perfectly* fulfilled by the use of this apparatus." (*Op. cit.*, Am. edit., p. 47.)

Smith, in his *Minor Surgery*, declares that Fox's apparatus accomplishes "perfect cures" in very many cases, and that it is "a very rare thing for a simple case to go out of the house (Pennsylvania Hospital) with any other deformity save that which time cures, viz: the deposition of the provisional callus." (*Op. cit.*, p. 209.)

Such testimony in favor of any dressing demands respectful attention; and I shall not be regarded as detracting from the respect due to these authorities, when I express my belief that it is in deference to the distinguished reputation of the surgeons who have during the last thirty years had charge of the services in that hospital, and who have been so loud in its praise, that the use of this apparatus has, with us, become so general. I believe, also, that, in some measure, this general preference is due fairly to the intrinsic excellences of the dressing. But I must be permitted to express a doubt whether it has made deformities of the clavicle "the exception, instead of the rule," with us. I have used this dressing, as may be seen by a reference to my cases, oftener than any other form, and yet my success has by no means been so flattering as has been the success of these gentlemen. I have seen others employ it, also, and with pretty much the same results. Nor ought it to be forgotten that, in

Great Britain, by far the greater majority of surgeons employ an apparatus essentially the same. I have seen it in many of the hospitals, and Mr. Bickersteth, one of the surgeons of the Liverpool Infirmary, informed me, in 1844, that it had been in use with them as long as thirty years. All that has justly been said against the English mode of dressing by slings, is equally true of this; and whatever has been affirmed of the danger of using an axillary pad, applies as much to this as to any other mode of using the same.

I believe, however, that, in the Pennsylvania Hospital, the axillary pad employed is not so large, and, especially, not so thick, as that recommended by Desault, and in this respect it is plainly an improvement; but then, in the same proportion that it is made less thick, it is less powerful to accomplish the indication in question; and if it merely fills the axillary space, then it is no longer a fulcrum upon which the arm is to operate as a lever, but it is only, in its effect "retentive."

Regarding, then, the importance of this question to the interests of surgery, and observing the wide differences of opinion which are entertained here and elsewhere as to the real value of this dressing, is it asking too much of these gentlemen, that they will present us some more precise statistical testimony? It will be observed that its advocates claim for it what is not to-day, at least, claimed for any other apparatus, viz: that, under its use in the Pennsylvania Hospital, and in the hands of private practitioners, so far as they have seen, deformities have become the "exception." It is affirmed to answer "perfectly" *all* the indications. By which it must be intended to say, that, in addition to both of the other indications, that also, which has always heretofore been found so difficult, if not impossible, the carrying out of the shoulder, is in a majority of cases perfectly accomplished. The clavicles are not shortened.

If it is intended, however, to say that a shortening is not generally prevented, but only that no unseemly projection of the fractured ends will be found to result, I reply, that then it does not answer *all* the indications, and I beg, further, to suggest that the avoidance of an upward projection seems, to me, to depend much more upon that part of any apparatus which lifts the shoulder, and which belongs to a multitude of other forms of dressing as well as to that in question, than upon that which forces the shoulder out, and it may be accomplished, in a majority of cases, as well without an axillary pad, with a mere sling, as with it. But, in fact, my experience has convinced me that the absence or presence of such a projection,

after union, is due more to the circumstances of the fracture, as to whether it is more or less oblique; and still more especially, to the degree of roundness, or emaciation of the patient, than to any form, or part, or condition of the apparatus. It will be found more distinct in oblique fractures than in transverse, and much more marked in thin persons than in plump, or fat persons, and more so in muscular than in non-muscular. In short, I affirm that such a projection has occurred as often under my observation, when this dressing has been used, as it has when other forms have been employed.

Finally, while I deprecate incautious assumptions in regard to the capabilities of any form of dressing for broken collar-bones, a disposition to which is manifested by more than one advocate of special plans,* I am ready to bear my humble testimony in favor of that one of whose claims I have taken the liberty to speak so freely, and which is usually known in this country by the name of Fox's apparatus, consisting essentially of a sling, axillary pad, and bandages to secure the arm to the chest, and to which the stuffed collar is a convenient accessory, but admits of various modifications, answering the same ends. Among the considerable variety of dressings which I have used, this, either with or without such slight modifications as I shall presently suggest, has seemed to be most simple in its construction, the most comfortable to the patient, the least liable to derangement (if I except Velpeau's dextrine bandage), and as capable as any other of answering the several indications proposed.

No apparatus is better able to answer the first indication, namely, "to carry the shoulder up," and thus to bring the fragments in line. If, as not unfrequently happens, the outer end of the inner fragment is also carried a little upwards and forwards, it may be, in some measure, replaced by inclining the head to the injured side, or by a carefully adjusted compress and bandage. But it is not probable that any patient will consent to remain a long time in a position so unnatural and constrained; nor is it very easy, as the experiment

* The bone will be found to lie quite smooth, to remain of its proper length, to unite, generally, within twenty days, and without any unseemly exuberance of callus. —*Liston.* At length, Desault proved that a feeble and unskilful mode of treatment was the sole cause of a want of success, and that, by being more correct and judicious, art might be as successful here as in other fractures. They supposed that to be a superabundant callus, which was nothing but a displacement of the fragments. These visionary hypotheses ceased to exist as soon as this displacement was prevented by a proper apparatus.—*Ibid.*

will show, to maintain a steady pressure upon this portion of the broken clavicle.

The second indication, "to carry the shoulder back," is certainly much more difficult of accomplishment than the first; and it does not seem to me to be fully met by the sling dressing, but, until some mode is devised less objectionable than any I have yet employed, or than any, the mechanism of which I have seen described, I see no alternative but to trust to that action of the muscles attached to the scapula, by which, as Desault first explained, when the shoulder is lifted perpendicularly, it is also in some degree carried backwards, and that, too, it has occurred to me frequently to observe, just as much as when the upward pressure is made with the elbow placed in front of the body.

It is my belief, however, from the evidences now before us, that the third indication "to carry the shoulder out" still remains unaccomplished; that it cannot be claimed for this, or for any other apparatus yet invented; that, in a certain class of cases which I have sufficiently indicated, constituting a vast majority of the whole number, it is able to prevent a riding of the fragments. Nor, seeing the difficulties in the way, and the amount of talent which has been already devoted to their removal, have I much confidence that this end, so desirable, and so diligently sought, will ever be attained. Yet it is presumptuous, perhaps, to say what the skill and ingenuity of a profession whose labors never cease, may hereafter accomplish.

Having already expressed my preference for the sling, I have only to add what I consider necessary modifications in the form of this dressing recommended by Dr. Fox.

Dr. Coates, in the excellent paper already referred to, calls attention to the danger of making too much pressure upon the brachial artery and nerves, when the axillary pad is used, and the arm is, at the same time, carried forwards upon the body. In bringing the elbow forwards so as to lay the forearm across the body, the humerus is made to rotate inwards, and the brachial artery and nerves are brought into more direct apposition with the pad. The same objection must hold, only in a greater degree, to M. Guillou's method of carrying the forearm across the back.

The humerus ought then to be permitted to hang perpendicularly beside the body, and thus the nerves and bloodvessels will be removed in a great measure, yet not entirely, from pressure. The pad (to be employed only as a part of the contentive means, and not as a fulcrum) should be firm, but scarcely thicker than is ne-

cessary to fill completely the axillary space, when the elbow is made to press snugly against the side of the body.

In consequence of having placed the elbow further back than is recommended by Dr. Fox, it will be necessary, also, to vary, in some way, the suspensory tapes; those coming from the humeral portion of the arm-tray must pass in equal numbers, and in opposite directions—before and behind the body—towards the stuffed collar; and each set of front and back tapes, attached to the humeral portion of the tray, must be in pairs, for the convenience of tying. I find it convenient also to secure the arm to the body by two or three turns of a roller, applied always with great care, so that its pressure shall be in no degree painful or uncomfortable.

APPENDIX.

AMERICAN INVENTIONS AND MODIFICATIONS OF APPARATUS FOR THE TREATMENT OF FRACTURED CLAVICLES.

Fig. 6. *George Fox's Apparatus.*—"Consists of a firmly stuffed pad of a wedge shape, and about half as long as the humerus, having a band attached to each extremity of its upper or thickest margin; a sling to suspend the elbow and forearm, made of strong muslin, with a cord attached to the humeral extremity, and another to each end of the carpal portion; and a ring made of muslin stuffed with cotton to encircle the sound shoulder, and serve as means of acting upon and receiving the sling." (*Sargent's Minor Surgery*, p. 149.)

Fig. 6.

George Fox's Apparatus.

Fig. 7. *E. Bartlett's Apparatus.*—"For an axilla pad, roll a strip of woollen flannel, four or five inches wide, around the axilla strap, to the size required.

"Put on the collar. Apply the pad, and pass the strap under the collar, thus securing each in its place.

Fig. 7.

E. Bartlett's Apparatus.

"The sling, being first attached to the collar by the forward strap, is made to receive the arm of the side affected, when the straps at the back

Fig. 8.

The Author's Apparatus.

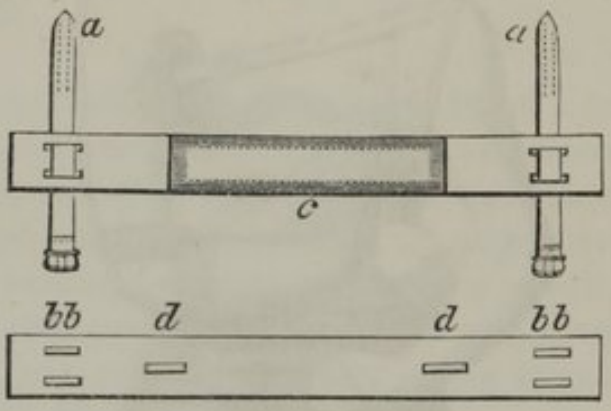
of the sling should be buckled, one behind, the other forward, to the ends of the collar with requisite tightness to reduce the fracture and maintain the ends in apposition.

"The apparatus may be used for either side, by changing the attachment of the sling." (*Dr. Bartlett.*)

Fig. 8. *The Author's Apparatus.*

Fig. 9. *E. C. Keckeley's Apparatus.*—"The splint, of which the accompanying figures give a representation, is two feet three inches long and three and a half inches wide.

Fig. 9.



E. C. Keckeley's Apparatus.

"The upper figure exhibits a front view, and the lower a back view of the splint. *a*, *a*. Are two bandages with buckles attached to one end of each. *bb*, *bb*. Are four mortised holes for the passage of the two bandages *a*, *a*. *c*. A portion of the splint padded, to prevent its bruising the patient. *d*, *d*. Two loops of leather, tacked on the back of the splint, for the passage of the bandages, where the mortised holes are too far apart for the breadth of the patient from shoulder to shoulder."

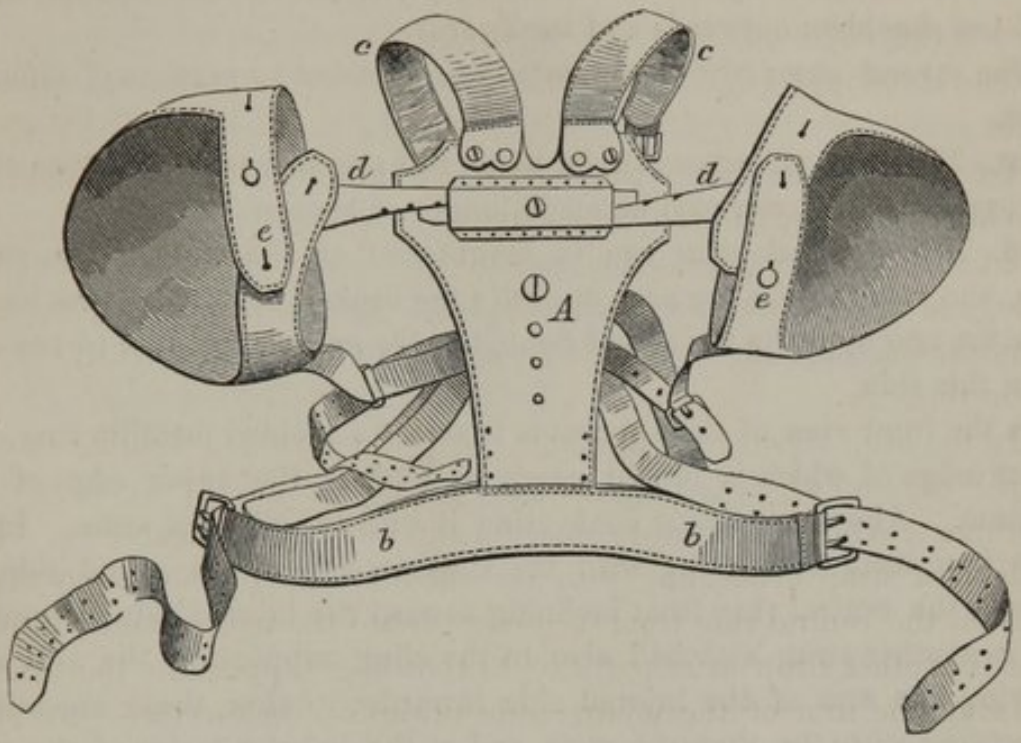
"*Mode of Application.*—The end of the splint corresponding to the uninjured side is to be pressed close to the back of the shoulder, and retained so by drawing the bandage tight, and retaining it by means of the buckle. Previous to fixing the bandage, it should be passed through two loops on a small pad, which is to be placed in the axilla. This pad is used for the purpose of preventing the cutting of the bandage. After passing the other bandage through two loops, on a large cuneiform pad, which is placed in the axilla of the injured side, it is drawn sufficiently tight and secured by the buckle. The last thing to be done is to place a handkerchief, doubled into a triangular form, in such a manner over the arm, the front and back parts of the thorax, as that it shall draw and confine the arm of the injured side close to the body, give it support, and prevent its falling down." (*Am. Journ. of Med. Sciences*, xv. 115, 1834.)

Fig. 10. *Welch's Apparatus.*—Back view, complete, with the exception of the sling and axillary cushion.

Fig. 11. Front view, complete, as it appears when applied. The frame, consisting of the dorsal piece with the thoracic and cervical arms, is formed of flexible metal, which yields sufficiently to adapt it always to the

motions of the spine and chest. The lateral or thoracic arms encircle the body, and the vertical or cervical arms, passing upwards, outwards and

Fig. 10.



Back View of Welch's Apparatus.

A. Vertical or dorsal piece. *b, b*. Lateral or thoracic arms. *c, c*. Oblique or cervical arms. *d, d*. Transverse or acromial arms. *e, e*. Leather shoulder-caps and straps.

Fig. 11.

Front View of Welch's Apparatus.

forwards, conform to the sides of the neck. The whole are well and thickly padded.

The transverse or acromial arms, running parallel with the spine of the scapula to the acromion process, are made of elastic steel, slightly curved backwards at their outer extremities, so that, when the shoulders are made fast to them by the shoulder-straps, they will tend constantly to pull the shoulders outwards and backwards.

The several parts of the apparatus are adjusted to persons of different sizes.

1st. The cervical arms can be made to approach or to separate from the arch, and they can also be made longer or shorter.

2d. The acromial arms can be lengthened or shortened upon either side, and when in use the arm opposite the broken bone should be longer than the one opposite the sound bone, to give greater freedom to the arm upon this side.

In the front view of the apparatus is seen "a padded metallic ring, the upper edge of which is placed nearly as high as the upper edge of the sternum. Above are straps connecting it with the cervical arms. Laterally is a strap connecting with the shoulder-cap of the sound side, to prevent the central ring from inclining toward the injured side; opposite this is another strap attached also to the sling supporting the arm and drawing the arm of the injured side inwards;" below these are straps connecting with the thoracic arms, and at the inferior point of the ring is a strap designed to support the hand and forearm.

Fig. 12.

Hunton's "Yoke Splint," modified by Day.

"The *sling* in which the arm rests has thin strips of metal sewed into the cloth, at the sides of the arm both above and below the elbow, with

rings for the straps, in order to give a uniform and unyielding support to the arm the entire length of the sling."

The axillary pad may be made in the usual form, and secured in the ordinary mode.

The inventor claims for this apparatus that it possesses, in common with no other apparatus, the essential and distinguishing feature of accomplishing the three indications through supports resting and depending almost exclusively upon the spine and sternum, and but slightly if at all depending upon the shoulder of the sound side, of whose motions therefore it is entirely independent. He believes that there is no motion of the body which can more than slightly change their relative position.

Fig. 12. *A. Hunton's "yoke splint," modified by Day.—New Jersey Medical Reporter*, vol. v. p. 146, 1852.