three and not more than 17 hours. $1\frac{1}{2}$ grammes killed a dog, male terrier, weighing 4675 grammes (proportion 1 to 3116.6), after 26 hours and within 37 hours.

One gramme was not fatal to a female terrier weighing 4517 grammes (proportion 1 to 4517), the symptoms passing off mostly in half an hour.

Of two rabbits, 1 gramme caused death in $56\frac{1}{2}$ minutes in a female albino weighing 1915 grammes (proportion 1 to 1915).

One-half gramme did not cause death in a full-grown male, weighing 1935 grammes (proportion 1 to 3870). The symptoms nearly gone in 41 minutes.

The action of resorcin upon these six warm-blooded animals was as follows:—

1. Restlessness and trembling.
2. Rapid respiration very early in both rabbits. Early and very marked after a lethal dose in one dog, later after a lesser, but fatal dose, in another. Not marked after non-lethal doses.
3. Staggering, unsteady gait, loss of co-ordination, especially in hind limbs, present early in all the animals excepting one rabbit where small dose exhibited.
4. Twitching of muscles, especially of hind limbs, constant in all.
5. Clonic contraction of nearly all flexors and extensors of body, more especially of those attached to the pelvis and shoulder.
6. In the animals that died the imitation of the natural running or hopping movements before death, as the animal lay upon its side, was striking.

Experiments upon six frogs, by hypodermic injections of resorcin, produced clonic contractions of muscles of extremities, whether the frog was pithed or not. Curarized frogs were affected scarcely at all by resorcin given hypodermically. Division of the sciatic nerve or sacral plexus caused quiescence of muscles supplied by the nerve trunks after giving resorcin.

ARTICLE VII.

PERIOSTEAL OSTEOID SARCOMA OF HUMERUS; AMPUTATION AT SHOULDER-JOINT; RAPID RECURRENCE; SUBSEQUENT EXCISION OF ENTIRE SCAPULA AND OUTER EXTREMITY OF CLAVICLE; RECOVERY. By W. J. CONKLIN, M.D., Dayton, Ohio; Professor of Diseases of Children in Starling Medical College.

CASE.—Mrs. H., æt. 37, married, consulted me in February, 1880, in regard to a tumour of the left humerus.

The following history was obtained: the growth began, about six years ago, as a small nodule upon the outer side of the arm, just below the inser-

tion of the deltoid. It increased in size very slowly, and caused little inconvenience until she became pregnant, fifteen months ago, since which it has grown rapidly, and is the seat of frequent and very severe paroxysms of pain. The tumour is hard and resisting, excepting in one or two circumscribed spots, in which slight elasticity is detected, distinctly lobed, and involves the greater portion of the shaft of the humerus. An osteoid sarcoma having a periosteal origin, and, therefore, probably malignant, was diagnosed, and immediate amputation of the arm advised. At this time, it would have been an ordinary shoulder amputation as the upper extremity of the humerus was not implicated in the disease. She, however, refused the operation, and did not again come under my observation until January, 1882.

In the eleven months which had elapsed since the first examination, the tumour had nearly doubled in size, and had extended upward so as to encroach upon and, indeed, project over the humero-scapular articulation. The accompanying engraving, Fig. 1, reproduced from a photograph taken

Fig. 1.

at this time, accurately represents the appearance of the tumour and its relation to the joint. The diseased arm gave a circumference of seventeen inches at the insertion of the deltoid, and nineteen inches and a half on a line with the axilla, while the measurements, at corresponding points on the sound arm, were respectively nine inches and ten inches. The extremity of the acromion process could not be distinctly outlined. The scapula moved freely with the arm, but the motion at the shoulder-joint was very limited, due, as was subsequently ascertained, to two outgrowths

from the under surface of the tumour which impinged upon the neck of the scapula. The patient suffered intensely, and was now eager to submit to any operation. It was proposed to remove the arm at the shoulder-joint, and in case the scapula should be implicated to proceed at once to the removal of all diseased portions. The manner in which the tumour overlapped the joint rendered it impossible to expose the articulation in the usual way. Three plans of procedure suggested themselves: first, using the arm as a lever to dislocate the head of the humerus; second, to elidse through the tumour; and third, to saw off the acromion and thus gain access to the joint.

The operation was made on the 7th of February, 1882, with the assistance of Drs. Reeve, Jewett, Weaver, and Neal. The patient being thoroughly anesthetized, a broad anterior flap extending from the posterior edge of the tumour, behind the axillary border, to the coracoid process was dissected well back over the acromion. Fortunately, strong manipulation of the humerus broke off the projecting processes above mentioned, thus permitting the head of the bone to be thrown out of the glenoid cavity and rendering the completion of the operation in the ordinary manner comparatively easy.

The neck and articulating surface of the scapula were now carefully examined by those present, and pronounced healthy. The patient rallied promptly from the operation and had a rapid and pleasant convalescence. The tumor was examined microscopically by Prof. Frankenberg of Columbus, O., and the diagnosis confirmed.

The respite was, however, doomed to be of brief duration. Three months after the operation an examination showed a recurrence of the disease in the scapula. Projecting from and accurately fitting the glenoid cavity was a hard, smooth, globular mass, which rounded out the shoulder with an ominous beauty. The new growth increased in size with frightful rapidity, dipping into the axilla, involving the coracoid process, the external clavicular articulation, and extending along the spine of the scapula, filling up the whole anterior portions of the infra- and supra-spinous fossae. In less than four months the growth attained the size and relations shown in the accompanying engraving, Fig. 2. The patient now suffered almost continuous pain; and, at times, especially at night, it became so intense as to compel her to walk the floor for hours. She felt that life was not worth having at the price of so much suffering, and earnestly urged that an attempt should be made to give her relief.

After a full and frank statement of all the probabilities she readily agreed to the only operative procedure practicable, *i. e.*, the excision of the entire scapula and a portion of the clavicle. The operation was performed August 30, 1882. Drs. Jewett, Weaver, J. Davis, Dougherty, and C. H. Conklin were present, and rendered efficient assistance.

The operation was begun with an incision over the clavicle, which was at once divided with a metacarpal saw, three inches from the acromial extremity. Turning the patient upon her right side, a horizontal incision was next made from the anterior projection of the tumour along the spine to the posterior border of the scapula.

The incision over the clavicle was then carried down to the inferior angle of the scapula, bisecting the transverse cut near its centre. The skin flaps thus formed were rapidly dissected up and turned aside. The trapezius, rhomboides, and levator anguli scapulae muscles were next successively divided, freeing the posterior border of the scapula, which was

Fig. 2.

then tilted forwards, the serratus magnus cut, and the subscapularis separated from its anterior attachments. The whole mass was now strongly pulled upward and backward, and the dissection rapidly completed, great care being taken to make the knife hug closely that portion of the tumour which projected anteriorly and into the axilla. In forcibly turning the scapula upon itself, so as to reach the deeper parts more easily, the clavicle was broken off very near its acromial attachment, where the bone was diseased; the removal of this fragment completed this part of the operation. Notwithstanding the care exercised in completing the excision the axillary artery was unfortunately button-holed just above the origin of the subscapular; it was promptly seized and compressed until the dissection was finished. The hemorrhage, although at times quite free, was less than was anticipated. Aside from the axillary artery, ligatures were only applied to the supra-scapular and a muscular branch in the lower part of the wound; two or three small vessels were secured by torsion.

No attempt was made to compress the subclavian artery, which, to say the least, is rarely necessary; it is far better to ligate vessels as they are cut, or, if more convenient, to apply compressing forceps until they can be permanently secured.

The flaps were trimmed so as to remove the cicatrix resulting from the previous operation, and two or three hardened and slightly enlarged glands were removed from the axilla. The flaps came together accurately, and were secured by sutures. The shock was slight, reaction being completely established in two hours. The incisions healed throughout their entire length by primary union, excepting at the bottom of the lower cut, which was purposely left open for drainage. Convalescence was rapid and uninterrupted save once, caused by the premature closing, through an oversight, of the drainage opening.

On the eighth day, the patient had a slight chill and some fever, an examination of the wound showed a small accumulation of fluid at the most dependent portion. An opening was made, not in the line of the

primary incision, a drainage tube inserted and the cavity thoroughly washed out with carbolized water. The discharge at no time great, gradually diminished, but, as a precautionary measure, the opening was continued until the falling of the ligatures. At the date of this report, November 20, 1882, the patient is enjoying excellent health, and there is no sign of a return of the disease.

It is not our present purpose to discuss, at length, the surgery of the scapula, but simply to record the above case as a contribution to the statistics of operations in this region.

The scapula has now been so often excised, either alone or with the arm and clavicle, and the results, so far as recovery from the primary operation is concerned, have been so uniformly successful that these operations are universally accorded a place in legitimate surgery. Indeed, the excision of the scapula, preserving at the same time a fairly useful arm, has been fitly named by Sir William Fergusson, the *ne plus ultra* of conservative surgery. Many surgeons entertain grave doubts as to the propriety of operating in cases similar to the one herein reported. Prof. Agnew in his work on Surgery, now being published, uses the following language: "In cases of enchondroma, caries, necrosis, and injury, the excision of the scapula, entire or in part, comes legitimately within the sphere of operative surgery; but when undertaken for the cure of malignant disease the propriety of such a procedure is very questionable indeed. And this opinion is formed after having carefully analyzed the results of operations executed for this purpose." Not a few, however, would dissent from this opinion. Perhaps no general rule can be formulated since the circumstances of each case must largely determine the advisability of operative procedures. But as pointed out by Rogers, in his classical article on "Excision of the entire Scapula," which appeared in this Journal in 1868, "we are not without hope even in unquestionably cancerous affections of this bone."

The celebrated cases of the elder Mussey, Syme, Rigaud, and others, in which life was prolonged from a few months to more than thirty years, certainly affords encouragement to operate. It would seem that where the entire disease can be removed with reasonable safety, the patient, after a frank statement of all the facts and probabilities, should have the benefit of the operation if he or she so elects. In our case, Mrs. H— unhesitatingly says that the immunity from pain since the excision amply repays her for submitting to the operation, even though the disease should again recur.

There are now recorded fourteen excisions of the scapula, with and without portions of the clavicle, subsequent to amputation at the shoulder-joint. We append a tabular statement embracing the salient points of each case so far as we have been able to gather them.¹

¹ I am greatly indebted to Drs. J. S. Billings and J. Ashhurst, Jr., for assistance in compiling the table.

No.	Operator.	Date.	Operation.	Disease.	Result.	
1	Mussey	1837	Removed scapula and clavicle 6 years after amputation at shoulder, and 19 years after amputation at metacarpus.	Osteo-sarcoma. Male, æt. 40; at date of last operation.	Recovery	Healthy and active 50 years after last operation.
2	Higand	1842	Removed scapula and outer end of clavicle eight months after amputation at shoulder.	Osteo-sarcoma. Male, æt. 51.	Recovery	Enjoying good health 3 yrs. after operation.
3	Ferguson	1847	Removed scapula and outer end of clavicle three years after amputation at shoulder.	Caries. Male, adult.	Recovery	Permanent.
4	Soupart	1837	Removed acromion, glenoid cavity, and internal table of anterior border of scapula, subsequent to amputation at shoulder.	Fibro-plastic tumour.	Recovery	Died from a recurrence of rheumatism in less than 3 months after operation.
5	Laugenbeck	1862	Removed scapula and one inch and a half of clavicle subsequent to amputation of arm.	Osteo-sarcoma. Male, æt. 23.	Recovery	Lived 18 mos. after operation.
6	Buck	1864	Removed scapula and part of clavicle, after amputation of arm.	Osteo-cancer. Male, æt.	Recovery	Died a few mos. afterwards from a recurrence of the disease.
7	Busch	1864	Removed scapula and part of clavicle, after amputation of arm.	Osteo-cancer. Female.	Recovery	Healthy 2 years after excision.
8	Krakowizer	1868	Removed scapula 5 years after amputation at shoulder.	Euchondroma.	Death.	7 days after the operation.
9	Stimson	1872	Removed scapula nine months after amputation of arm.	Splindle-celled sarcoma.	Recovery	
10	Jenfferson	1873	Removal of scapula and 2 nd of the clavicle four months after amputation of arm.	Osteoid cancer. Female, æt. 20.	Recovery	Disease recurred in stump very soon after operation.
11	Beronbalx		3 operations were made. Resection of the head of the humerus; amputation at shoulder; and, finally, excision of the scapula. Interval between operations not given.	Malignant disease.	Recovery	Death. Died a few mos. afterwards from a recurrence of the disease.
12	Higand.	1875	Removed scapula eighteen months after amputation at shoulder-joint.	Osteophytos.	Recovery	Healthy 6 years afterwards.
13	D'Ambrosio.	1880	Removed scapula and end of clavicle 11 months after amputation.	Myxo-sarcoma.	Death.	Survived operation 13 days.
14	Conklin	1882	Removed scapula and 3 inches of clavicle six months after amputation at shoulder-joint.	Osteo-sarcoma. Female, æt. 37.	Recovery	