ART. VII.—*Case of Resection of the Head and Upper Third of the Humerus for Enchondromatous Tumour.* By HANFORD N. BENNETT, M. D., of Bridgeport, Conn.

SOME time in the month of May, 1860, Mr. Henry A. Andrews, of Brookfield, Conn., a farmer by occupation, discovered a tumour upon the outer face of his right arm, directly underneath the belly of the deltoid muscle. Its discovery was altogether accidental; it had been preceded by no local pain, had already attained considerable size, and could be traced to no cause except it might be the severe muscular exertion incident to the patient's calling. I was consulted soon after and found, upon examination, a tumour of bony hardness, about the size of a hen's egg, immovable, with no irregularities of the surface, and not tender to pressure. Thinking that it might be a simple exostosis, I advised no operative procedure, but merely care in the use of the limb. I did not see the case again until August of the following year. The tumour had now attained large dimensions, having extended upwards nearly to the head of the humerus, and the whole of the deltoid being stretched over its surface. A similar growth was also projecting from beneath the outer edge of the deltoid muscle, covered only by the skin and cellular tissue, nearly globular in form, and exhibiting a slightly nodular surface to the feel, which was not at all discoverable beneath the thick belly of the muscle. I could not now doubt that the tumour was an osseous or osteo-cartilaginous outgrowth. It was already impairing the use of the limb, especially in those movements controlled by the deltoid, and I advised the patient to submit to an operation as soon as he could arrange for that purpose. Various circumstances, however, prevented a compliance with this advice, until the 8th of January, 1862, when he presented himself for operation. The arm being now measured over the largest portion of the tumour, was seventeen inches in circumference, and the outgrowth extended from the neck of the humerus to the insertion of the deltoid, presenting no irregularities except that which projected from beneath the outer edge of this muscle, the main body of the tumour being of very symmetrical rotundity. The patient suffered no pain in the affected part, and no inconvenience except the loss of the horizontal motion of the arm, and a sense of weight which was now beginning to be considerable, and which would have undoubtedly soon produced relaxation of the ligaments of the joint, and finally laxation of the head of the bone.

The history of the case and the perfectly healthy appearance of Mr. A. led me to believe that the tumour was benign in its character, but its growth had been somewhat rapid, and the diagnosis could but be uncertain. In view of all the circumstances, I proposed a resection of the bone and outgrowth rather than an amputation at the shoulder joint, and with this intention

called Dr. Joanthan Knight, of New Haven, and several of my medical friends of this city to consult upon the case, and if thought advisable, to assist at the operation. The result of the consultation at this time was unfavourable to an attempt at resection, its feasibility being questioned in consequence of the large size of the tumour, and the ulterior usefulness of the limb being doubted from the extent of bone which must necessarily be removed. It was agreed, however, that a small incision should be made down to the tumour, for the purpose both of ascertaining the relations of the outgrowth to the bone, and of determining its true pathological character; if it should be found that the bone was not involved so as to necessitate the removal of the head, then I was to attempt an excision merely of that portion of the shaft of the humerus included in the disease. The examination proved conclusively that no operation short of a resection involving the head of the bone was practicable, and this was negatived. A minute piece of the foreign growth was removed and examined with the microscope and its non-malignant nature thus rendered quite certain. The patient was now dismissed to await the farther progress of the disease, as I had determined not to amputate the limb until such time as it should become an absolute necessity. The small wound made at this time, however, could not be healed in consequence of the extreme tension produced by the outward pressure of the tumour, and suppuration became very profuse, so much so that it soon told seriously upon the general health of my patient. He rapidly emaciated, and in short presented all the constitutional symptoms of suppurative irritation, so that at the end of five weeks it became evident that something must be done immediately, and notwithstanding the apparently unfavourable condition of things, I determined to attempt the resection.

On the 14th day of February, 1862, I proceeded to the operation, assisted by Drs. Wm. B. and David Nash, Drs. Hubbard, Burritt, and Gregory, all of this city. I adopted the method of Larrey, the only one, in fact, practicable in this case, and, the patient being put fully under the influence of ether, I made an incision along the outer face of the arm, directly over the most prominent part of the tumour, commencing just above the point of the acromion and terminating a short distance below the insertion of the deltoid, thus completely bisecting this muscle (which was much atrophied) in the direction of its fibres. Two arterial branches were divided, which were immediately tied in order to lessen the amount of hemorrhage as much as possible. I was able to detach the integuments from a considerable portion of the outer and more prominent surface of the tumour by the aid only of my fingers, and then having carefully separated the periosteum from the bone immediately below the excrescence, I passed a spatula underneath the humerus and sawed it off just at the insertion of the deltoid. Having now command of the bone, it was not difficult, by a careful dissection, to sever the connections with the muscles; I

succeeded, also, in saving a narrow strip of healthy periosteum, varying from half to three-fourths of an inch in width, along the inner face of the bone almost to its neck. After finally dividing the insertions of the pectoral and latissimus dorsi muscles, using the bone as a lever, its head being rotated forwards and outwards, the capsular ligament was divided and the resection completed. I should add that care was taken to preserve the tendon of the biceps. The wound was now closed with sutures and adhesive straps, and having flexed the forearm so that it would lie horizontally across the abdomen, I fastened the entire limb in this position to the trunk by long adhesive straps reaching well around the body. The patient was much prostrated by the operation, but rallied quickly from the effects of the ether, and after the administration of a full dose of sulphate of morphia, slept quietly about two hours. From this moment the case progressed steadily to a complete healing of the wound, and to a perfect restoration of health. A somewhat profuse suppuration commenced a few days after the operation, but the appetite and digestion being excellent, the waste was supplied, and Mr. A. gradually gained strength, so that at the end of five weeks he was enabled to go home by railroad, a distance of twenty-five miles. The external wound was now healed, with the exception of two points from which the pus issued, and I instructed the patient to commence passive motion of the forearm, the movements of the hand having been at no time impaired. Suppuration ceased entirely at the termination of the sixth week, and the wound was permanently closed. In the month of May following (three months after the operation) the Connecticut State Medical Society met in this city, and I presented my patient to this body. The flexion and extension, pronation and supination of the forearm, were already nearly perfect, and the limb, in walking, hung in a natural manner; so much so that no one would observe any alteration in its carriage. From that period the strength, and consequently the usefulness of the arm, have steadily improved up to the present time, though the horizontal movement is of course lost. At this date, sixteen months after the operation, I have just received a letter from Mr. Andrews, in which, speaking of the usefulness of the arm, he says he "*can plant corn as fast as any man.*" The limb has shortened nearly an inch and a half, and I am satisfied, from an examination which I made on the 1st day of April of this year, that there has been a slight reproduction of bone up to within two inches of the glenoid cavity.

Remarks.—An examination of the tumor after its removal showed a conglomerate of cartilage and bone, which had sprung from the surface of the humerus, and had been developed in nodules of cartilage, which ossified from their centre, thus imitating the normal process of the ossification of cartilages. The form of the outgrowth had evidently been moulded to a considerable degree by the action and resistance of the deltoid, and this muscle seemed as it were to grasp the tumor beneath its fibres, with the exception of that portion which projected beneath its anterior edge; between

this and the main body of the exerescence was a deep sulcus, evidently formed also by the action of the muscle. The outgrowth did not entirely surround the bone, but left intact a narrow strip on the inner face, from which, as I have before stated, I detached and saved a small portion of healthy periosteum. The length of bone removed, including the head, was five and a half inches; the tumour involved it from the neck of the humerus to within half an inch of the point at which it was sawed off, and was thirteen inches in circumference at its largest part, measuring in the direction of the circumference of the bone.

I was not aware, at the time of this operation, that resection of the head of the humerus for bony tumour had been so rarely performed. As far as I can learn, my case is the first in this country, and the records of European surgery furnish only five examples of analogous character. Dr. Hodges, of Boston, in his admirable monograph on excision of joints, mentions four of these, viz., two by Mr. Hutchinson, one by M. Roux, and one by Bickersteth. The three first were unsuccessful in their results, as the disease was in each instance of malignant nature, the patients either dying soon after the operation, or later from a recurrence of the disease. The case of Mr. Bickersteth was a simple exostosis, and the operation was undertaken for the purpose of relieving the motions of the joint, the result being satisfactory. Prof. Syme has also operated successfully in a case of bony tumour (non-malignant) involving the head of the humerus, his patient recovering with a useful arm. As I have never read the report of this case, I am unable to say certainly what was the extent of the resection, but believe it involved less of the shaft of the humerus than my own.

Prof. G. B. Günther, of Leipzig, in the edition of his large work on operative surgery now in course of publication (*Lehre von den blutigen Operationen am menschlichen Körper*), has a table of seventy-six cases of resection of the head of the humerus, chiefly drawn from the records of continental surgery, but not one of these was for bony tumour, the whole number being made up of resections for gunshot wounds, caries, or compound or comminuted fractures.

It will be seen from the cases thus far recorded, that those for bony tumour of a malignant nature have all been unsuccessful, while those of a benign character have all been successful, both as regards the recovery of the patient and the usefulness of the limb; so that although the cases are too few in number from which to draw accurate conclusions, yet as far as they go, they indicate the propriety of resection in cases of non-malignant disease in preference to amputation at the shoulder-joint. And even in malignant affections of the bone, it is questionable whether the results thus far attained favour amputations at the joint in preference to resection, since the statistics of the amputation, even under the most favourable circumstances, present a frightful percentage of mortality.