REMOVAL
OF
THE CLAVICLE,
WITH
A TUMOR SITUATED IN THAT BONE.

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A YOUNG gentleman, æt. 10, a native of the East Indies, but resident during the last five years in this country, stout made and healthy, was the subject of this operation. In the summer of 1836, a swelling, the size of a hedge nut, was discovered by his maid in washing him, on the centre of the left collar bone. It was firm, but not painful. Ten days previously, Master P—— had fallen out of a wheelbarrow in the garden while at play with a schoolfellow, and complained at the moment of having hurt his shoulder. A highly respectable surgeon of the neighbourhood was now requested to see him, and the following are, in his words, the impressions he received from a careful examination. “My opinion was, that a blow had been received upon the bone, and that inflammation and effusion under the periosteum was the consequence; but I did not think the bone had been broken through its whole substance; I considered it

inflammatory, and ordered leeches and cold lotions." A stellate bandage was afterwards applied, but the tumor increasing, Master P—— was brought to me for an opinion about two months after its discovery. It was then oval shaped, about the size of a pigeon's egg, firm but elastic, and painful only when compressed. The motions of the arm were quite unimpeded. It gave me the idea of a false joint after a central fracture, or at least of a cyst enclosing the broken and ununited portions of the bone.

Slowly but sensibly the tumor increased, retaining the character of a dense walled cyst; continued pressure by the pad and bandage was of no avail, and leeches and cold lotions, blisters, the mercurial and iodine ointments, successively employed, were equally ineffectual.

The lad's health continued undisturbed, but after some months the skin became slightly coloured from distension, and pressure was more painful. I introduced a grooved needle at the most elevated part of the tumor, and moved the point of it in a small cavity, an inch or more in depth from the surface. A few drops of black grumous blood were discharged. The notable changes in the progress of the disease, when of six months' standing, were the more advanced and somewhat undulating outline of the surface, and its more extended and fixed base, which could not be traced beyond an oblique line of discontinuity of the clavicle, distinctly perceived on the sternal side; at the scapular end the bone was absorbed in the tumor. In May of the present year, (1837,) the base of the

tumor from its scapular extremity occupied full three-fourths of the bone; about two-thirds of its circumference was supra-clavicular, so that, in the erect position of the body, it was seen by a person standing behind the patient over the fall of the trapezius. The skin had a purple hue from congestion of the superficial purple veins, but there was no sign of pressure on the blood vessels or nerves of the arm.

In a consultation with Sir A. Cooper and Sir Benjamin Brodie, it was determined to remove the clavicle and tumor connected with it, and assisted by the latter gentleman, I performed the operation on the 6th of June, 1837, about a twelvemonth from the date of its origin.

The little patient being recumbent, with his shoulders raised and head slightly averted, a crucial incision was made through the integument and platysma myoides, one limb of which was nearly in the line of the clavicle, and the other at right angles; and the flaps and fascial coverings successively dissected down to the external basis of the tumor. The pectoralis and deltoid muscles were then carefully detached from their clavicular origin, avoiding the cephalic vein, and the fibres of the trapezius and cleido-mastoid muscles divided on a director. One considerable vessel, in the situation of the transversalis humeri, required a prompt ligature. The circumference of the tumor was now well defined, though it was found to be firmly imbedded, and adherent on its posterior aspect. Disarticulation of the scapular extremity of the bone was next effected with-

out difficulty, and the mobility thus communicated to the mass facilitated the completion of the operation. A director was now worked beneath the bone, as near to the sternal articulation as was practicable, and with a pair of strong bone nippers thus introduced, it was completely and clearly divided. The sub-clavius muscle and a part of the rhomboid ligament were now detached from the tumor, and the mass being well raised by an assistant, while the edges of the wound were kept wide apart by metallic retractors, the cervical prolongations of the tumor were separated from their remaining connections by a few touches of the scalpel, without injury to the subclavian vessels.

The operation occupied some time, but the boy displayed good courage as it proceeded; very few vessels were tied, and the loss of blood did not exceed 12 ounces.

The symptomatic fever was smart, but perfectly manageable by the usual aperient and diaphoretic medicines, and the convalescence proceeded without interruption. Master P—— was removed to Richmond at the end of a month, carrying his arm in a sling, the wound being for the most part cicatrised. He has since remained in perfect health, and it is worthy of observation that there is scarcely any perceptible falling forward of the shoulder, nor any restriction of the motions of the arm; he elevates it perpendicularly over his head, extends it horizontally, carries and rotates it behind the trunk, and performs the same extent and variety of circumduction, and with equal promptitude and power as the parallel

movements of the other arm. Indeed, one of his amusements is rowing a boat upon the Thames. The production of bone of a cylindrical figure from the truncated sternal extremity of the clavicle extends at least two inches, and terminates beneath the centre of the cicatrix in a firm ligamentous band adherent to the skin.

Structure of the Tumor.—The tumor presented on its anterior aspect a regular curvilineal surface, posteriorly it was irregular, dipping in prolongations between the interstices of the cervical muscles, to which it was firmly fastened. This difference is at once explained by the resistance of the platysma and strong fascia supporting it in front, and the yielding of the intermuscular spaces below. A very dense fibrous expansion invested it on all sides, and from a puncture of the principal cyst in the operation, the same dark grumous fluid exuded as followed that made by the needle three months before. The section of the tumor in its longest diameter presented an arrangement of cells or chambers, of pretty equal dimensions, filled with dark solid coagula of blood, the edge of the scalpel grating as it passed upon particles of osseous matter. One larger compartment, deeply situated, was without a clot, having been filled with the dark fluid blood before mentioned. The investing membrane was evidently the condensed periosteum, the cells were the irregularly expanded cancelli, and the calcareous particles were the débris of the bony plates and walls.

Here then was a blood tumor of the bone, com-

mening in its medullary structure and inducing an equal absorption of its earthy material. What was its nature and origin? Was it osteo-aneurism, or a passive hæmorrhage from rupture of a vessel of the medulla, or an undetected and ununited fracture of the bone, the periosteum remaining entire? No reasonable doubt, it appeared to me, could exist on two points; first, that it began in the cellular structure; secondly, that it was the result, direct or indirect, of the fall.

If it belonged to the class 'oste-aneurism,' as described by M. Breschet*, to which its structure offers the nearest analogy, I should say that it wanted the ordinary character of aneurism in being painless, at no time communicating the faintest pulsation, and on section not presenting any laminated fibrinous deposit, or trace of inflammation, other than the periosteal cyst thickened after the manner of a hernial sac. The simplest reading of the case is, that a medullary extravasation had taken place from the concussion attending the fall, or from a fracture within the periosteum, in either of which cases the effused blood, which in a perfect solution of continuity of the bone would have been absorbed, acted as a foreign body upon the surrounding textures, and by effectually stopping the osseous secretion and starving the bone, became the instrument of the absorbing process. Nor does it appear how in such cases the process of union should

* For a careful collection of these cases, with an interesting account of their pathology, see a 'Probationary Surgical Essay,' by P. D. Handyside, M.D., Edinburgh, 1833.

take place. According to the invariable law of tumors, the natural defensive process is set up in the external wall, whether the work of construction or destruction is proceeding in the interior, from the mere expansion of the part. But whether concussion or fracture had been the origin of the effusion which, retaining fluidity in one larger compartment, formed compact clots in the remainder, it is clear that in this case, the periosteum, being continuous, had not secreted bone, but organizable lymph agglutinating it with surrounding membranes, and that neither any process of preservation nor of active destruction had taken place in the bone, but a mere shelling of the animal structure by the removal of the earthy cells and walls. The inorganizable, yet inoffensive character of effused blood, when unexposed to air, could alone have originated and maintained this passive condition.

It must be admitted, however, that the actual origin of this, as of many results of remote injury, is conjectural, and that present appearances do not always afford sufficient criteria for retrospective explanations. The bone aneurism is often devoid of pulsation, pain is not a constant symptom, and the history of the disease does not, I believe, offer a single example of its occurrence in the clavicle, with which to compare that here recorded. The size and situation of the bone affected by this disease may much modify appearances.

The youth and the constitution of the patient, however, the chronic march of the disease, its non-inter-

ference with health, and the uniform and complete disappearance of the bone from the tumor which occupied its place, coupled with the absence of all inflammatory action, or secretion, strongly impress me with the belief that its origin was the simple local one which I have attempted to describe; viz. a casualty attended by circumstances in which nature was unable effectually to relieve herself; and that the denomination of aneurism, would therefore convey an erroneous, as well as painful impression of its nature.

I meet with four cases of the removal of the clavicle. One for a caries of the entire bone done in the hospital at Zurich in 1822, by a single incision along the lower edge of the bone without hæmorrhage or difficulty of any kind. The patient was afterwards able to perform all the movements of the arm forwards, backwards, and upwards. He continued his avocations, and died six years afterwards of phthisis*.

Three operations for osteo-sarcoma of the bone are on record. The first dates more than a century back; it was performed by Mohring, who was I believe a Prussian surgeon. I have been unable to trace the reference which is given in Dr. Otto's Compendium of Pathological Anatomy. (Kulmus resp. Mohring D. de exostosi steatomatode claviculæ, ejusque felici sectione. 4to. Gedan, 1732.)

The case of Dr. Mott, of New York, occurred in the summer of 1828, and is given, though abridged from the Medical Repository of that city, in ample de-

* Journal der Chirurgie und Augenheilkunde. Lond. Med. Gazette, Vol. XIII. p. 63.

tail, in the London Medical Gazette*. The tumor of the left clavicle is described as being four inches in diameter, of a conical figure and incompressible hardness, and consisting of a bony cup, cartilaginous, or semi-osseous towards the centre; the two ends of the bone being movable upon one another, so that its proper structure was entirely destroyed. The operation appears to have been performed with skill and courage, and was doubtless a difficult one. The case terminated most successfully†.

Dr. Warren, of Boston, another distinguished surgeon, and like the former, my friend and fellow student, contributes the fourth case. This was also an osteo-sarcoma. The tumor, in its greatest transverse diameter, measured 7 inches, was hard, and conveyed

* Vol. III. p. 405.

† In a letter which I recently received from Dr. Mott he refers to this case in the following words. "The young man upon whom I operated on the 17th of June, 1827, has ever since enjoyed excellent health. Subsequently to the operation he studied divinity, and is now a clergyman in Charlestown, South Carolina. I have seen him several times since his recovery, and there is no falling of the shoulder nor any alteration in his symmetry. As the bone was removed from opposite the coracoid process to the articulation with the sternum, I have not found any attempt at a reproduction from the scapular extremity. The mass removed was nearly the size of my two fists, the chasm was prodigious, and from being in an ulcerated and bleeding state the cicatrix of course would be very large. The firmness and size of this seems to be a great support to the shoulder. The subclavian artery, as it passes over the first rib, can be seen beating distinctly under the cicatrix. The support which I gave the shoulder by an apparatus for a year after the operation, contributed greatly to preserve its natural position.

an indistinct pulsation, being situated at the sternal end of the right clavicle. The operation was happily performed and concluded, but the patient exposed himself to cold on the 13th day, and died in the fourth week from the operation, of pleuritic inflammation. In both of these cases the acromial extremity of the bone was sawn through with a chain saw, and the sternal end in the first disarticulated; how it was detached in the second, is not mentioned. In both, the external jugular vein was tied.

Dr. Warren, a sound authority, considers the osteo-sarcoma to have its origin in the periosteum, not in the bone.

Dr. Otto says—"Vices of texture occur proportionally but rarely on the collar-bones; however, rickety expansion, erosion from aneurism, caries, necrosis, and osteo-sarcom have been observed."*

Reflecting on the simple origin and nature of the morbid change, as I have ventured to explain it, in this specimen, and the serious aspect it presented to us in consultation, as a probable osteo-medullary fungus of a malignant character, or a spina ventosa of the affected bone, or a formidable disease of the soft parts secondarily affecting the bone, it seems to me more than probable, that many of the anomalous fixed tumors on record have their origin in changes within the medullary canal of the bones as in the cavities and chambers having bony walls, viz.

* Compendium of Pathological Anatomy, p. 217; by Adelph Wilhelm Otto, M.D. Translated from the German by J. F. South, 1831.

the sinuses of the head and face, which are exasperated into intractableness by their confined situation, and complicated by the changes they produce in the surrounding parts.

There can be no doubt that injuries, more serious in their consequences than those of fracture and displacement, are often inflicted upon bone; as when adhesive, (i. e. ossific) inflammation, the only healing process of which bone is capable, is prevented by the circumstances of the injury, or on the other hand, is set up in preternatural situations or in morbid excess. Sometimes a bone is killed outright, sometimes disorganized only in part, by a blow or a fall; and the particular circumstances which, in such cases, determine the separated periosteum, or the deranged cancellary membrane, to secrete bone or to secrete pus, to generate osteo-sarcoma or the medullary fungus, are not merely local, but constitutional. The differences which induce in one case interstitial ulceration, (caries,) in another progressive ulceration or detachment from the living margin, (exfoliation,) in a third, a process of renovation simultaneous with the disorganizing process, or a transfer of the nutrient action from one set of secreting vessels to another, at the expense of the original structure, (necrosis;) all these differences lie open for investigation under the general head of diseases of the bone from mechanical violence, apart from section, fracture, and displacement. They have hitherto escaped description, if not notice, under this head, being for the most part produced by causes apparently so inadequate and indirect, as to

evinced a morbid state of the constitution in the individual.

The following categorical summary I think my own experience will enable me to verify ; the records of surgery would do so abundantly.

1. Periosteal inflammation and bony accretion or deposit upon the surface of the bone, with and without previous suppuration.

2. Inflammation, terminating in abscess of the periosteum or cancelli.

3. Inflammation, and ulcerative interstitial absorption of the bone (caries).

4. Rupture of the periosteal vessels and partial absorption of the bone, or rupture of the blood vessels of the cancelli, and extravasation and absorption of the entire bone.

5. Osteo-aneurism, or aneurism of the capillaries within the bone.

6. Death, and exfoliation of a portion of the bony shell.

7. Disorganization, and separation by ulcerative progressive absorption of the entire shaft after the deposit of a periosteal shell (necrosis).

8. Disorganization, and death of a defined portion of the entire cylinder of the long and entire substance of the flat bone, and consequent external abscess.

9. Exostosis, periosteal or medullary, or osseous tumor of the long and flat bones.

10. Spina ventosa, or inflammatory and sanguineous deposits in the cells of the articular extremities

of bones, irregularly expanding them, and ultimately reducing the walls of the bone to a net-work, crackling upon compression.

11. Osteo-sarcoma, or cartilago-osseous tumor of the periosteum and surrounding textures, secondarily implicating the bony, and contiguous soft structures.

12. Malignant, or medullary and hæmatoid fungus of the cancelli, and deposit of new septa or new exterior shell.

Postscript.—*May 1, 1838.* As nearly a twelve-month has elapsed since the operation was performed, I may add, that the subject of it remains in perfect health, and has the full and free use of the arm.