THE PATHOLOGY AND DIAGNOSIS OF NECROSING ETHMOIDITIS.¹

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THE first announcement of the disease which forms the subject of this communication was made in the spring of 1885, when I had the opportunity of reading a paper upon it at the Medical Society of London. This was published,² and was illustrated by original drawings by Mr. Thurston of specimens furnished to him by me for the purpose. The results then established were, in brief, as follows:

The middle turbinated process of the ethmoid is subject to an inflammatory affection, which in the first instance occasions a large increase of the fibrous tissue elements of its mucoperiosteum. This fibrosis follows the vessel tracts, chiefly into the substance of the spongy bones, encroaching upon the blood vessels, and starving their contents by the pressure so caused. At this stage, myxomatous (polypous) tissue begins to appear in a certain number of cases. At the same time atrophy of the bone becomes general, as indicated by the presence of Howship's lacunæ and osteoclasts. Large and small cavities were met with, which tended to coalesce, and the contents of which, by pressing on the atrophying bone, led up to cleavage of the mass. The contents of these cavities at this stage were then described as constituted in some cases of granulation tissue, in others myxomatous, though in other instances, again, they seemed empty. In a certain number of examples necrosis of the bone was apparent microscopically, and was likewise manifest clinically in situations where the disease was not removable by operation—for example, the nasal wall of the ethmoid cells. Where this wall had in part disappeared, the ethmoid cells themselves exhibited evidence of necrosis, presumably arising by extension from the turbinated process, though in some instances the disease probably originated in the cells, and affected the spongy process later. In 1887 I published a treatise on *Ethmoiditis*, in which, *inter alia*, this disease was indicated as the pathological cause of nasal polypus, and the persistent recurrence of polypi after operation was referred to unremoved ethmoidal disease. Coming to more recent times, I found that Mr. Thurston's report was thought to require corroboration, so that, in 1889, I determined to submit the matter to reinvestigation, and was fortunate in securing for this purpose the services of Dr. Sidney Martin. The following is a *verbatim* summary of his report of his examination of some twenty specimens of the disease removed by operation.

DR. SIDNEY MARTIN'S REPORT.—The specimens of diseased middle turbinate bone examined (twenty in number) all show that there is a profound change in the mucous membrane, the result evidently of a chronic inflammation.

1. The change of the *mucous membrane* is of varying character. In some cases it is simply an increase of fibroid tissue; in others it is an increase of fibrous tissue with a small-celled infiltration. In others, again, to these changes may be added the increase of myxomatous tissue. When the myxomatous tissue is increased, it may be simply in patches here and there, or it may be almost solely confined to the surface of the mucous membrane, or it may be between the trabeculæ of bone as well. When at the surface of the mucous membrane, it may form a belt of tissue visible to the naked eye. When deep down in the turbinate bone, it expands the trabeculæ of bone, producing absorption of it. The effect of all these changes in the mucous membrane is to make it thicker, but in some cases, where there are cysts in the turbinate (process), the mucous membrane is atrophied as well as fibroid.

2. The effects of the changes of the mucous membrane on the glands, arteries, venous sinuses, and bony tissue, are important.

a. *Glands*.—In nearly all the cases examined, the glands were pressed upon by the fibrosis of the mucous membrane, and in many cases they had atrophied so completely that only a trace of their existence could be found.

b. The *venous sinuses* were also in all cases pressed upon; in extreme cases they were obliterated, in others distorted and separated from each other.

c. *Arteries*.—Important changes were noticed in the arteries in five cases. In all except one, the external coat was thickened; the lumen of the vessel narrowed, sometimes containing thrombi. In Case I the middle coat was chiefly affected, and the arteries generally were extensively diseased (fibrosis).

d. The *bony tissue* showed absorption in nine cases. This was shown in thinning of the bone, and in the formation of Howship's lacunæ. Along the edge of the bone there are indentations (Howship's lacunæ) which are present whenever bone is being absorbed. The lacunæ are like little bays in the bony tissue; the edge of the bay next the bone is lined usually with loose fibrous tissue; sometimes there is an osteoclast present. In some cases the absorption has progressed right across the lamella of bone, so that what was once bony tissue is now occupied by fibroid tissue. By this means progressive thinning and absorption of the bone is brought about. Necrosis in Case I was complete, in Case VII only partial, and the necrosed part in the latter case was adjoining the mucous membrane which embraced some of the trabeculæ of bone. In these cases, diseased and partially occluded arteries were seen.

e. *Cysts*.—Cases II, IX, XI show cysts expanding the bone; Case XVIII showed small cysts in the mucous membrane. These latter are probably the precursors of the large cysts expanding the bone seen in Cases II, IX, XI. Both classes are associated with fibrosis of the mucous membrane. The cysts are mucoïd, and may probably arise from occlusion of Bowman's glands. (They are lined with goblet-celled epithelium). They seem to be a pathological accident of the disease of the turbinate bone.

Fig. 1. *Cysts*.—A, commencing cystic formation; B, bone thin but normal; C, lacuna of cyst wall; D, extreme fibrosis of mucous membrane; E, blood sinus.

It is of interest to note that these cysts were observed from the first, though in the earlier report they were called "cavities." An example of one was figured in the articles published in the *Lancet*, and at the Medical Society I exhibited

¹ Read in the Section of Surgery at the Annual Meeting of the British Medical Association, held in Bournemouth, July, 1881.

² *Lancet*, July 18th and July 25th, 1885.

another specimen of a cyst or cavity removed in 1884. Dr. Martin's analysis substantiates their origin as mucoid cysts, and shows them to be the outcome of ethmoiditis as I originally described them, since they are always "associated with fibrosis of the mucous membrane," and are "a pathological accident of the disease of the turbinate bone." Since the publication of the above-mentioned paper, attention has been called by at least three observers to the occasional presence of cysts in this region, each observation being regarded by its author as original or quasi-original, in ignorance of my investigations, and in complete failure to recognise what can be no longer doubted, that these cysts are simply "pathological accidents" of that inflammatory affection of the ethmoid whose earliest and most distinguishing factor is fibrosis of the mucous membrane. These cystic cavities occasionally attain large proportions (Fig. 1). Their bony walls undergo absorption, and, yielding to the pressure of their contents, the entire turbinated process becomes divided into two parts, and exhibits the phenomenon of cleavage, illustrations of which are given in Dr. Martin's full report.

Fig. 2. *Necrosis*.—A, extreme fibrosis of arteries; B, complete necrosis of bone; C, separation of periosteum.

When I recall the period, now some twelve or thirteen years ago, at which the earliest investigations of this disease were commenced, and remember all the difficulties, perplexities, and disappointments experienced in dealing with what was then an almost unexplored region, I am not surprised to find there are many who, on the one hand, either deny or ridicule the existence of this disease, or, on the other hand, being unable to ignore the evidence of their senses, maintain the conditions observed to be normal. My one answer to these objectors is to refer them to the original report on the subject, and more especially to that extended investigation which I am now able to place on record.

A proper method of examination is essential for diagnosis. For this a good reflected light is the first requisite, and the next is a suitable speculum. The blades of the latter should not be fenestrated; that known as Thudichum's is by far the most serviceable. The third point is that the patient's head must be inclined backwards, so that the nasal orifice is brought nearly into a line with the observer's eye. When the speculum is then introduced and gently raised, the anterior margin of the middle spongy bone becomes visible, deeply situated behind and above the lower spongy bone. In the healthy state it presents a pale, thin, rounded surface from a third to half an inch long, apparently descending from the roof of the nose, though really curving downwards from its junction with the outer wall, being, in fact, an integral part of the inner

wall of the ethmoidal cells. Any marked deviation of the septum or thickening of its surface will obscure the view of the middle spongy bone, as will also any considerable enlargement of the lower spongy bone. The use of a cocaine spray before examination will usually obviate the latter difficulty, and will, under any circumstances, enlarge the view of the upper part of the nasal cavity.

In the first stage of ethmoiditis, with commencing fibrosis of the mucous membrane, a more or less uniform thickening of the presenting surface is apparent; and this gradually increasing comes to fill up a considerable part of the middle channel of the nose. As seen from the front the tumour at this stage presents very much the aspect of an ordinary date-stone. The septum nasi always yields to it, and is pushed over to the other side when the disease is unilateral. A large number of cases of deviation of the septum arise in this way. The nasal bone and the corresponding process of the superior maxilla likewise yield to the pressure exerted by the new development; so that on careful examination the external surface of the nose is noticed to have become slightly expanded. The broadening of the bridge of the nose will be more marked if the affection be bilateral.

The second stage of the disease is manifested by the presence of proliferation, which may consist either of granulation tissue or of myxoma (polypus). Granulations, when present, are firmer, redder, and more irregular in shape than polypoid growths. True myxoma is frequently made first evident along the free margin of the tumour, appearing as a whitish swelling with broad base, freely movable by the probe. In this state it may remain unchanged for a long period; while granulations, on the other hand, usually arise from the outer surface of the process, and thence grow inwards in the direction of least resistance. Coincidentally with these changes others are in progress, unrecognisable by the eye at this stage. Of these, that in the bony tissue is the most important. First comes absorption, due mainly to the development of fibrosis along the tracks of the vessels which everywhere permeate the bone, and leads to their more or less complete occlusion. Absorption of bone follows as the natural result of this gradual impediment to its blood supply. This bone atrophy is marked by the presence of erosions of its surface—Howship's lacunæ—with occasional gaps in the continuity of the trabeculae, the interspaces being occupied by fibrous tissue. At the same time, changes are going on in the glands which convert them into cysts, of which several are usually present, and sometimes coalesce or even unite with the large cavity or infundibulum situated near the base of the spongy process. These cysts, however large, and whatever adhesions may exist between their walls and neighbouring parts, are never isolated pathological phenomena, but are always in origin associated with pre-existent inflammation of the soft tissues, attended with fibrosis and myxoma, and with what is still more essential to their formation, a widely diffused absorption of bone, due to arterial changes, which permits the gradual expansion of the spongy process. In this way these intratubinate cysts occasionally attain enormous size. Their boundary wall is constituted of attenuated bone up to the period of cleavage, which may occur only after a considerable time. This event takes place when the atrophied bony wall of the cyst is no longer able to resist the pressure of the accumulating contents. It then opens at its weakest part, and the superimposed fibrosed structures, which are still less able to resist the pressure, likewise yield, so that a longitudinal cleft of variable size is left. This cleft is frequently indicated by a line of muco-purulent secretion which collects about it. If, however, this line be explored by a probe it will enter the substance of the tumour to a variable depth. Later on, as the soft tissues shrink away from the cleft, the division into halves becomes more marked. It should be noted that whenever the middle spongy bone attains a considerable size the presence of a cyst may be surmised; and this will be verified by applying the galvanocautery point to the more prominent part of the swelling, when it will be found to sink deeply into the adjacent cavity.

The last morbid condition to be considered is necrosis of bone. This may occasionally, though not often, be detected at the deepest part of a cyst or cavity, especially if large, and of some standing (Fig. 2). The favourite situation for necro-

sis, however, is at some part of the wall of the ethmoidal cells, here constituting the outer wall of the nasal cavity. To detect this necrosis a suitable probe is necessary, as the ordinary surgical probe is quite unsuitable. In my earlier explorations I used a canaliculus probe, but latterly I have had flat silver probes made for the purpose, as they more readily pass between the tumour and the boundary wall of the nasal cavity into the spaces above or outside this. The presence of necrosis in these regions is indicated by exactly the same signs as elsewhere—namely, a bare, rough, and grating surface, which may often be tapped with the probe so as to elicit a sound as though striking a billiard ball—that is, it is clearly audible to anyone near the patient. Hitherto the diagnosis of ethmoiditis has been considered in connection with gross and manifest changes in that process or wing of the ethmoid known as the middle spongy bone; but an almost equally extensive class of cases exists in which no such external indication of the disease is present. In these the middle spongy bone shows no departure from the normal, except perhaps in looking redder and of less even surface than usual. The necrosis will, in such cases, be found in the walls of the ethmoid cells, which are frequently partly broken away, so that the probe grates against the detritus and enters one of the ethmoidal cells. Here the necrotic process may not extend beyond the nasal wall, though it may not rarely be detected in the depths of the cell structures of the bone.

As with cleavage too evident to be ignored, so with the equally undoubted necrosis, it has been seriously asserted that these changes are merely normal to the region. Surely the force of antagonistic criticism could no further go. My answer, here as ever, is an appeal to pathology. This shows the necrosis to be the final event in a series of morbid changes which, beginning with fibrosis, goes on to obliteration of arteries, absorption of bone, the development of cysts and of polypous and granulation tissue, until finally interstitial death of the bone takes place. The starved bone breaks up into minute areas of dead matter, which, until removed by the art of the surgeon, constitute a source of constant irritation, just in the same way as does a decayed tooth or a carious astragalus.

In conclusion, I believe that the designation "necrosing ethmoiditis" will be found to be amply justified by the judgment of every careful and unprejudiced observer of this disease.

THE INSIDIOUS MARROW LESIONS OF MAMMARY CARCINOMA.¹

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THE Museum of St. Thomas's Hospital contains a very remarkable specimen (No. 673), the plaster cast of the body of a woman, who died in that institution, after excision of the right breast for scirrhus carcinoma. The skeleton has undergone great distortion. The sternum and ribs have sunk until the former appears almost to touch the vertebral column, the whole thorax being flattened out transversely. The pelvis exhibits a precisely similar modification. The right humerus and both the femora have undergone fracture, the broken ends having subsequently united almost at right angles. A seemingly healthy scar occupies the position of the right breast, and no tumour formation is anywhere apparent. The left femur, one-half the right, a patella, and the right humerus from this case are mounted as dry specimens, and constitute typical examples of "osteoporosis." The other half of the right femur had been preserved in spirit, and Mr. Shattock was kind enough to make a microscopical examination of this for me. He pronounced the bone to be infiltrated by "typical spheroidal-celled carcinoma of the firm kind, a growth similar to an ordinary carcinoma of the breast." Fig. 1 is taken from a photograph of the plaster cast of this case; Fig. 2 represents the bones from the same case, which are mounted as dry specimens.

This specimen affords an extreme example of the pathological condition to which I desire to draw attention—a wide

diffusion of cancer cells throughout the bone marrow. This lesion is not exceptional; in a much less conspicuous form it is a routine occurrence in most average cases of breast scirrhus allowed to proceed to a fatal termination. I say "average

Fig. 1.—Plaster cast, No. 673, St. Thomas's Hospital Museum.

cases," because those "atrophic" scirrhus tumours, which do not prove fatal for twenty or thirty years, constitute an exception to the rule. In these the so-called "rheumatic" pains and the other bone symptoms I shall indicate are conspicuously wanting, so far as my own experience goes. In such I have not

Fig. 2.—No. 672, St. Thomas's Hospital Museum. Right femur, half of left femur, right humerus from case in Fig. 1; mounted as dry specimens.

found malignant cells in the bone marrow, and I am disposed to attribute their protracted duration largely to this circumstance. The "atrophic" condition, I need hardly remark, is restricted to spare women, whose mammae approximate to those of the male, and are therefore not placed in that very intimate connection with the general circulation and with the lymphatic system which obtains in the average female.

¹ Read in the Section of Pathology at the Annual Meeting of the British Medical Association, held in Bournemouth, July, 1891.