

the tissue without disturbing the relation of the structures entering into its anatomy. On the other hand, it is rarely, if ever, the practice of the operator to excise a portion of bone entire from the shaft; when disease exists there it is removed piecemeal, and the same opportunity is therefore not afforded for minute examination. The disease seems primarily to start in the cancellous tissue of the bone where small grey nodules may be found; these multiply and coalesce, forming irregular areas; the collection then tends to cascade. The cartilage over the articular surface of the affected area of bone may be normal in appearance. In a case of early hip-joint disease I assisted Mr. Watson Cheyne in the removal of the head and neck of the bone; the following appearances I quote from my notes of the case: "The articular cartilage seemed healthy, but the ligamentum teres was soft and of a somewhat gelatinous consistence. The appearance of the bone, on external examination, was normal; on making a longitudinal section through the neck and head it was found that the cartilage was separated from the osseous tissue below, on which it was freely movable; there was an inflammatory condition immediately beneath the cartilage; the bone in the immediate neighborhood was softened and carious; a small focus of yellow caseous material, the size of a threepenny piece, existed in the substance of the neck in the anterior and lower portions; another focus was present in the cut edge of the femoral neck; there had evidently been a portion of this focus left unremoved in the lower fragments of the femoral neck." These caseous foci may still further break down, and cavities may thus be formed; the tubercular network of osseous tissue being destroyed, the diseased area is surrounded by bone in a state of irritation, the blood vessels are dilated, exudation of the leucocytes occurs, and a collection of these cells, plus broken down tissue, is found in the cavities thus formed; we have in this way established a collection of pus in the cancellous tissue. The stages then in the development of tubercle may be summed up thus: (1) The typical grey tubercle; (2) the caseous mass; (3) the formation of a cavity; (4) a collection of pus with the entire destruction of the osseous tissue.

If we enquire for one moment into the minute anatomy of these conditions, we will find that

the tubercular process, as manifested in bone, presents the same characteristics as it does in other tissues, modified somewhat, however, by the peculiarities of the osseous tissue in which it grows. If the grey tubercle be examined under the microscope we find one or more giant cells; surrounding these is a zone of cells of irregular outline, and outside these again a zone of round cells like leucocytes. Between the cells is a network of fibrous filaments. These appearances are so familiar that I need only mention them. A necessary item, however, among the constituents of the tubercular nodule is the bacillus tuberculosis, which is, we are bound to consider, always present, at all events during the earlier stages of the development of the mass. The life history of the nodule is determined by the fact that it is extravascular; there are no blood vessels among the cells; the osseous tissue in the immediate neighborhood shows an increased vascularity and an increase in the number of cells; these blood vessels, however, do not enter the nodule. A study of these special characteristics enables us to understand the peculiar features presented by tubercle. The fact that it is non-vascular explains the fact that these nodules do not grow beyond a certain size; further, the nutrition being necessarily defective; the nodules tend to undergo retrogressive changes, and we have, in consequence, fatty degeneration, the formation of a necrotic mass, and finally a caseous nodule is produced. We may find tubercle in isolated patches or nodules such as I have described, or, what is more common, a number of these coalesce and form an irregular mass of cells, which will eventually undergo retrogressive changes. The tubercular nodule does not always cascade; occasionally we find a sclerosed condition at the seat of the disease; this condition of affairs* has been described as follows: In the centre we find an accumulation of cells such as I have described. Immediately beyond this there is a growth of osteoblasts, deeply colored; this color, it is suggested, may be due to the presence of micro-organisms. After a time the osteoblasts form a mass of sclerosed bone; in fact, we have a tubercular deposit to begin with, which engenders a condensing osteitis in a limited area of bone, and so the formation of a non-vascular solid

*Macnamara: *Diseases of Bone and Joints*, p. 108.