

tention to the frequent occurrence of cancer in women affected with the nodosities.

ARTHRITIS DEFORMANS IN CHILDREN.—The disease is not of frequent occurrence in children. Koplik, in 1896, was able to find but eighteen recorded cases, and Garrod has shown that all cases which on account of their clinical features are classed as such are not truly of that nature. Schüller⁴⁰ goes yet further and expresses the conviction that all the cases that have been described as occurring in children are examples of polyarthritis chronica villosa recently described by him. The pathological conditions of the joints in three fatal cases reported by Still⁴¹ undoubtedly conform more closely to the latter disease than to arthritis deformans, the articular cartilages showing no destructive change, and the clinical manifestations are so much at variance with those seen in adults as to leave ample room to doubt the occurrence of true arthritis deformans in childhood.

The onset is generally acute, sometimes with fever and chill, and it almost always begins before the second dentition. Girls are oftener affected than boys, but in a lower ratio than is the rule in adult life. Swelling of the joints with stiffness and some tenderness is the rule. Exacerbations are frequent. Such complications as dystrophies of the skin and nails are infrequent. The enlargement of the joints appears to be due to a general thickening of the soft parts rather than to exostoses, but the limitation of motion may be extreme. General enlargement of the lymph nodes and spleen has been pointed out by Still, who also observed pericardial adhesions. The children generally show lack of development. Spender and Diamantberger have reported its association with exophthalmic goitre, also an infrequent disease of childhood, and Still notes a prominence of the eyes in all his cases.

CHARACTER OF THE DEFORMITIES.—The deformities of the hands and feet are quite characteristic of the disease. The changes in the metacarpo-phalangeal articulations cause the fingers to turn toward the ulnar side. At the same time the fingers are often flexed strongly upon the palm and usually overlap one another. There may be also a bending of the distal extremities toward the radial side. These changes along with the wasting of the interossei muscles give the hand a claw-like appearance, resembling that of progressive muscular atrophy.

Most of the joints are firmly locked, but they may be abnormally movable and easily dislocated. A ball-and-socket joint is sometimes formed and other peculiarities are occasionally met with. In some cases a fusiform enlargement occurs, as a result in great measure of the thickening of the soft structures about the articulation, which gives the joint the appearance of being surrounded by plastic matter.

The feet are, as a rule, extended to the fullest degree, and the joints are even more rigid than are those of the hands. The toes are turned outward and overlap, the great toes being involved with the rest.

The deformity of the large joints consists chiefly in a widening of the articulation by the osteophytic growths and the lipping of the ends of the bones. The appearance is often that of fluid distention, but palpation readily reveals the presence of bony excrescences sometimes covered only by the integument and apparently sharp enough to cut their way through it. The greatest prominence is on a level with the articular surfaces, as a rule. Fluid distention does occur, especially in recent cases, but the appearance is not materially different from that due to osteophytic enlargement unless the adjacent bursae become involved. The dorsum of the wrist is a favorite seat of bursal distention. Adventitious cysts may cause swelling at some distance from the affected joint. A fusiform enlargement like that which occurs in the fingers is at times seen about larger articulations, particularly the wrist, entirely destroying the normal contour of the joint.

As a result of the changes in the hip and knee and coincident muscular contraction, the legs are closely flexed upon the thighs and the thighs are partially drawn up; or the limb may be rigidly extended. Involvement

of the shoulder and elbow leads to similarly rigid abnormal positions of the arms. Thompson⁴² has demonstrated that the rigidity of the joints is not to any extent overcome by anaesthesia. The enlargement and deformity are rendered all the more apparent by the wasting of the muscles about them.

The results of spondylitis are exceedingly distressing to the patient, for it is in the spinal column that we meet with the most pronounced bony ankylosis. All motion is lost in extreme cases. When the cervical spine is affected the head is sometimes drawn to one side and its rotation may be prevented. The patient loses his upright bearing and must maintain his equilibrium with a cane. The osteophytic growths can sometimes be felt; they occasionally impinge upon nerve roots causing radiating pains and causalgia.

The Blood.—Sufficient attention has not been given to the investigation of the blood and other fluids. Banatyne⁴³ found the hæmoglobin generally deficient, with slight diminution of the red corpuscles and slight increase of the white. He did not find microcytes or nucleated cells. Cabot⁴⁴ reports five cases in which the blood was normal except for a slight deficiency in the hæmoglobin of two cases.

The Urine.—Albuminuria has seldom been noted except in the aged, in whom its occurrence cannot be attributed to the arthritis. Von Noorden⁴⁵ and Rumpf⁴⁶ have observed a diminution of the salts of lime and magnesia and of phosphoric acid; the former observer noted a like diminution of the same ingredients in the faeces. Schüller has also noted a deficiency of lime salts and of the earthy phosphates, a low specific gravity, and a neutral or alkaline reaction in most cases; his investigations extended over many years.

DIAGNOSIS.—It is often difficult, if not quite impossible, to differentiate arthritis deformans of either type from corresponding rheumatic affections until comparatively late in the course of the disease. In the acute cases, however, suspicion should be aroused by the symmetrical involvement of the small articulations alone and by the stationary character of the affection, especially if it appear in a woman whose age and history render the disease of probable occurrence. Involvement of the endocardium in a measure contraindicates the disease. Persistent joint enlargement after the first acute symptoms have subsided is almost pathognomonic.

Chronic rheumatism does not as a rule involve so many joints, is more likely to be unilateral, and does not so often attack the temporo-maxillary articulation. Neither form of rheumatism produces the creaking crepitus, the characteristic deformities, or the degree of immobility which pertain to this disease.

Gonorrhoeal rheumatism may resemble arthritis deformans in its tendency to involve the larger joints and to remain localized. It is to be recognized for the most part by the history of a previous urethritis, by the absence of osteophytic growths, and by a tendency to an increase of the joint fluid, rather than a diminution of it, in even the most chronic cases.

From chronic gout this disease is distinguished by the symmetry of the lesions, by the involvement of many small joints instead of a single one, by less pain, by the absence of tophi, by the enlargement of the ends of the bones, and by the absence of a pronounced hereditary tendency. Arteriosclerosis occur in arthritis deformans only as senile changes.

The shoulder joint is sometimes affected by a localized arthritis, which may bear clinical resemblance to this disease. Several such cases are referred to by Anders and by Osler. It affects, however, only the capsular and other ligaments of the joint; the wasting of muscles is confined to those attached to the "shoulder girdle," and recovery from it is complete.

Progressive muscular atrophy may be differentiated by the absence from it of any affection of the articulation.

Sciatica rarely arouses suspicion of arthritis. It may be excluded by the extension of the pain to the dorsum of the foot, by the absence of tenderness in the joint, and

by the ability of the patient to cross the affected leg over the sound one while sitting; but sciatic pain sometimes occurs in arthritis deformans.

Charcot's Disease.—The joint lesions which sometimes occur in connection with locomotor ataxia are difficult of differentiation only when they occur early in the disease, before the pathognomonic symptoms of the ataxia have developed. They may generally be excluded by the presence of inco-ordination and other symptoms of ataxia, by their sudden onset, and by the more rapid, painless, progress of the joint affection. Neither is the osteophytic growth so great, as a rule; the changes are atrophic rather than hypertrophic.

Joint lesions clinically resembling those of arthritis deformans are at times met with in syringomyelia. The latter disease, however, is oftener seen in early life, and it exhibits disturbances of sensation and other manifestations typical of spinal-cord disease.

Hæmophilia sometimes presents joint lesions, but they, too, are more frequently encountered in early life. Bowlby⁴⁷ has shown that there is an effusion of blood into the joint, often but not necessarily a result of injury, and that fibrous adhesions are formed between the cartilaginous surfaces.

The deformity of the hip occurring in coxa vara is clinically identical with that of arthritis deformans, in some cases at least. Maydl⁴⁸ says it cannot be differentiated without operation and inspection of the joint. Fortunately the disease occurs only in young subjects at or before puberty.

Polyarthritis Chronica Villosa.—Under this name Schüller⁴⁹ has recently described a joint disease clinically resembling deforming arthritis. It is most frequent in females before the menopause and may occur in childhood. The pathological lesions are confined to the synovial membrane; they may continue for a decade without destruction of cartilage, although they may produce deformity and restriction of motion amounting to ankylosis. Pain is a prominent symptom and its occurrence is largely independent of movements of the joint. A monarticular form occurs, but it is much less frequent than monarthritis deformans. Schüller finds a bacillus which differs from that found by him in this disease.

MacLagan and Barlow⁴⁹ refer to a "spurious arthritis" in which the symptoms are like those of arthritis deformans, the former describing it as a result of injury, the latter as occurring in alcoholic neuritis.

PROGNOSIS.—Arthritis deformans is incurable. Much may nevertheless be done in the early stages to check its progress and during the acute exacerbations to relieve suffering. It is not directly dangerous to life. The patients may live to old age in comparatively good health, if death does not occur from some intercurrent malady. The progress of the disease usually becomes slower as it advances and the suffering becomes less intense, although its victim may become bedridden from weakness and deformity. Through this disability it predisposes the patient to many affections that are apt to hasten his death.

TREATMENT.—The treatment is that of a slowly debilitating disease. The patient is below par and every effort should be made to improve the general condition and to correct such concomitant defects as may exist in the action of organs. The abstraction of blood and the administration of debilitating drugs are alike to be avoided. Our most potent and the safest agencies withal are found in hygienic and dietetic measures.

All authors agree that if the patient lives in a vitiated atmosphere, especially if he occupies damp apartments, he should be removed to more salubrious surroundings where there is an abundance of fresh air and sunshine, and that all worry and care should be taken from his mind; but, unfortunately, these requirements are quite beyond the reach of a majority of the cases. A mere change of air and scenery is often beneficial, and residence in a warm climate, where the atmosphere is dry, not too near the seashore, is highly recommended. Every precaution must be taken against exposure and chilling of

the body. Woollen garments should be worn next the skin the year round. The hands and feet when affected must be well protected from cold. The bare feet should never be allowed to come in contact with even a carpeted floor.

The diet should be liberal and of the most nourishing quality; it should include an abundance of nitrogenous food, beef, mutton, poultry, eggs, milk and cream, with a plentiful allowance of vegetables and fresh fruits. Malt liquors may be taken with the meals. Cod-liver oil alone or in combination with malt extract has proved of great service in improving the nutrition of the patients, and should be taken regularly after meals during the winter season. The digestion should always be a subject of care.

During warm weather the patient should spend much of his time in the open air and he should take as much light exercise as is judicious. Even the affected joints ought not to be allowed complete rest, but they should never be exercised to the point of fatigue or pain. Passive motion is safer when the joints are painful. Walking is apt to hasten the progress of the disease in the hip or knee.

Many methods of local treatment have been employed and some of them have been lauded as curative; but local measures can only modify local conditions. They do not remove the cause, and improvement induced by them is apt to prove but transitory.

Thermal baths have been of much benefit in some cases, but are regarded as harmful by several authorities. Garrod says: "It would seem that in this disease the mode in which the water is employed is of more importance than the chemical composition, but at several of the places at which the most satisfactory results are obtained the waters are of the sulphurous class." He has found that the most effectual line of treatment is that which consists in massage combined with douching without the actual immersion of the patient. Suitable places for the application of this treatment may be found in all parts of the world. In Europe, Aix-les-Bains and Aachen (Aix-la-Chapelle) bear the highest repute; in England, Bath and Harrogate. In the United States sulphur springs are numerous and many places are equipped with suitable arrangements for properly carrying out the treatment. The springs bearing the highest repute are the hot sulphur springs of Virginia, the Hot Springs of Arkansas, and Glenwood Springs, Colorado. General vapor baths afford temporary relief. They should be taken immediately before retiring and not at too frequent intervals. Local vapor baths applied to the affected joints have been found safer and more beneficial. Electric baths have been applied in various ways, but the results have not been encouraging.

When these methods are inconvenient or beyond the means of the patient, equally good results may usually be obtained from hot fomentations and other methods of home treatment. Relief of pain may be obtained from the immersion of the joints once or twice daily for ten minutes in water as hot as can be borne. Hot water applied in a stream from a small orifice with considerable force is more quickly stimulating and produces an agreeable sensation. Schüller and Baruch⁵⁰ recommend the Scotch douche in which an alternating stream of hot and cold water under varying pressure is applied. Baruch follows this with the application of wet compresses. The application of moist heat should be accompanied by massage of the muscles. The Swedish movement is also beneficial. Following massage, belladonna ointment may be applied if the joints are painful, or a mixture of equal parts of guaiacol and glycerin may be rubbed in. The application of ichthyol in alcohol and ether or by inunction in vasogen (ten to twenty per cent.) is highly recommended by Edlefsen,⁵¹ who finds that it not only relieves the pain, but also contributes to the restoration of mobility. After this treatment the joint should be wrapped in cotton and covered with oiled silk. Complete rest may be secured by allowing the limb to rest on a splint. Strümpell recommends the application of

hot sand, a method used by Haygarth. None of these methods can be relied upon, however, unless they are thoroughly carried out; half-way measures are more likely to do harm than good.

The hot-air treatment has been much resorted to of late and has yielded excellent results in some cases. It is applied by means of an apparatus devised for the purpose. This consists of an asbestos-lined cylinder which is provided with a lamp to heat the air and a thermometer. The joint to be treated is loosely but closely wrapped in a Turkish towel and thrust into the cylinder, where it rests on a hammock-like support. A canvas sleeve attached to the cylinder is drawn close around the limb to prevent the escape of heat. The lamp is then lighted and allowed to burn until the thermometer registers from 250° to 300° F., when it is regulated to maintain the temperature for from a half-hour to an hour. This should be followed by passive motion of the joint and massage of the muscles. The treatment is to be repeated at intervals varying from a half-day to several days, according to the condition of the patient and the effects produced. Lindemann⁵² has recently invented an apparatus for this treatment, which he calls an "Elektrotherm." The heat is produced by electricity and may be applied to the entire body or to any part of it. From its use he reports excellent results in deformative arthritis of long standing.

Whatever benefit is obtained from the hot-air treatment is doubtless due to its effect upon the circulation of the part, the chief element of which is probably a persistent dilatation of the blood-vessels. On account of the possible disturbance of the general circulation and the elevation of the general temperature, the duration of the treatment should be carefully regulated to suit the physical condition of the patient. All local measures should be employed with caution in the presence of acute symptoms; they may be applied with more vigor in advanced cases.

The application of electricity is considered beneficial by some authorities but useless by others. The faradic current may be used for its action on the muscles and the galvanic for its effects on the nervous system. When the latter is applied, a mild current with slow interruption should be passed through the affected nerve trunks, through the nape of the neck, and through the dorsal region. Static electricity has also been employed in various ways. Morton⁵³ claims that the high potential high frequency current will arrest the progress of the disease at any stage, the result being secured more slowly in proportion as the disease is more advanced. He recently exhibited skiagraphs to demonstrate the benefits of treatment by what he calls the "electric wave" current.

Internal medication is of little benefit except in the early stage of the disease or during acute exacerbations. Anodynes are then sometimes necessary, opiates should be avoided if possible. Chloral, highly recommended by some writers for the relief of pain, is also objectionable on account of the possible development of a habit. The salicylate of soda is effective in the relief of acute symptoms in some cases, but it is liable to do harm if too continuously administered. It is the custom of many physicians to administer iodine or one of its compounds, and by many authors this is regarded as the most beneficial of all remedies, but the results obtained by others have not been uniformly satisfactory. The syrup of the iodide of iron is probably the best means of administering it, since the iron exerts an influence upon the anemia that is usually present. It is of especial value in the arthritis of children. It may be advantageously combined with arsenic in the form of liquor sodii arseniatis. The tincture of iodine is preferred by some authorities and many instances of marked benefit have been reported from the use of arsenic alone.

Other remedies have been vaunted for a time or by individual observers, but they have failed to stand the test of time. Even Brown-Séquard's elixir was resorted to with supposed benefit, and it is not surprising that the ovarian extract has recently been recommended.

Whatever the treatment adopted in a given case, one fact should be borne in mind, namely, that not days nor weeks, but months, must elapse before a verdict can be pronounced upon its results. *James M. French.*

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ARTHROLOGY.—That part of anatomy which treats of the joints or connections between the denser parts of the skeleton. By means of these joints, or articulations, the skeleton, originally an apparatus for support, becomes an apparatus for locomotion. In its primitive condition the human skeleton is without joints, being represented, in the human foetus before the fifteenth day, by a simple non-jointed rod of condensed embryonic tissue called the notochord, a form permanent in the lowest vertebrate (amphioxus). This becomes ensheathed with tissue, which is the matrix of the more complex skeleton (Fig. 329). The substance of this sheath changes to cartilage at regular intervals, thus becoming segmented (Fig. 330). Vestiges of the notochord are found in the adult as pulpy masses within the discs

which unite the vertebræ. Elsewhere in the human body joints are formed in a similar way. Rods are laid down and then segmented by the differentiation of certain portions into cartilage, which may afterward ossify. The structures by which union is effected at the joints may, therefore, be considered as the altered remains of the original skeletal matrix. Around the segments this matrix remains as fibrous tissue, termed the perichondrium, becoming periosteum when ossification ensues,

FIGS. 329 and 330.—Formation of Primitive Joints.

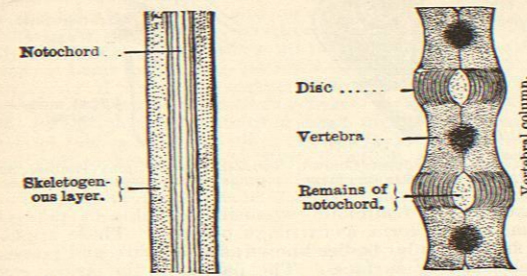


FIG. 329.—Notochord without Joints. FIG. 330.—Joints Derived from It. (Foetus fifteen days.) (Child at birth.)

and between the segments it occurs as similar fibrous tissue, changing to fibro-cartilage in certain cases. When in the form of bands, straps, or membranous sheets, these transsegmental structures are termed ligaments. They may unite not only the apposed ends of segments, but also the related sides. Sheets of this sort passing laterally from one bone to another in the same plane are known as interosseous membranes. Examples are seen between the radius and ulna, and between the tibia and fibula. The entire ligamentous system is closely connected with the fasciæ, of which it may be considered a specialization (see *Fasciæ*).

The prime characteristic of joints is, therefore, the movements which become possible by reason of segmentation. These movements vary according to the varying functions of the segmented members, and thus pro-

FIGS. 331 and 332.—Synarthrodial Joints.

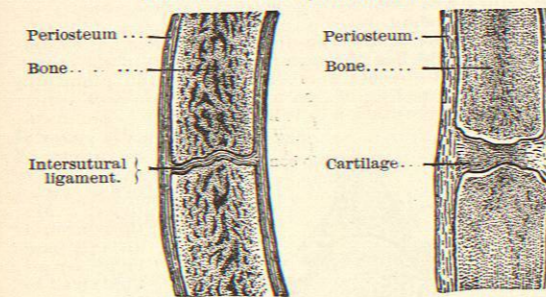


FIG. 331.—Suture.

FIG. 332.—Synchondrosis.

duce corresponding modifications of structure in the parts composing the joint. Upon these modifications the classification of joints depends. In all joints there is originally sufficient intersegmental tissue to permit slight and limited motion. Such are called primitive or amphiarthrodial joints. Examples occur in the adult between the bodies of the vertebræ (Fig. 330). In the course of development the osseous or cartilaginous tissue of the segments usually tends to encroach more and more upon the intersegmental structure. If no alteration occurs in this, the joint becomes less and less movable until complete fixation ensues. It is then termed synarthrodial or immovable. Examples are seen in the adult skull. The process may be carried so far as wholly to obliterate

the joint. When the connecting substance is fibrous, the joint is termed a suture (Fig. 331); when cartilaginous, a synchondrosis (Fig. 332). Strictly speaking, the union of the shaft of a long bone with its epiphysis is a synchondrosis. There being no strain caused by movement in this class of joints, the periosteum passes over the intersegmental tissue without thickening into ligamentous structures.

In by far the greater number of cases the intersegmental tissue becomes altered. Between certain of the cells, vacuoles or small cavities form (probably by the enlargement of the lymph lacunæ of the connective tissue), and these join together, making a larger cavity or cleft. The cells immediately around the cavity form a secreting surface, the synovial membrane, the product of secretion being a glairy fluid called synovia. The membrane resembles the similarly formed serous membranes of the body, as well in structure as in great vascularity, and in liability to sudden and dangerous inflammations. Synovial cavities are formed not only between the apposed segments of a joint (Fig. 333), but also where tendons

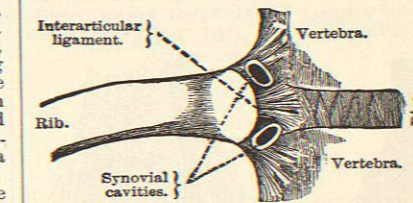


FIG. 334.—Costo-Vertebral Joint.

rub over hard surfaces, or where the skin is closely applied to such surfaces and friction is frequent (see *Bursæ*). Small and imperfect synovial cavities exist in a few amphiarthrodial joints, but usually the joints where they occur are freely movable throughout their extent, and are, therefore, called diarthrodial. The intersegmental tissue may not be wholly obliterated by the cavity. When the movement of the segments is perfectly regular and small in amount, it may remain as a central band with a cavity on each side and ligamentous structures surrounding the whole, forming a capsule or envelope. This is a peculiarity of the articulation of the heads of the ribs with the spine (Fig. 334). When the movement is such that the articular surfaces do not correspond, a synovial cavity is sometimes formed along the surface of each segment, leaving an intervening disc of fibrous tissue, which becomes partly cartilaginous and is then known as an interarticu-

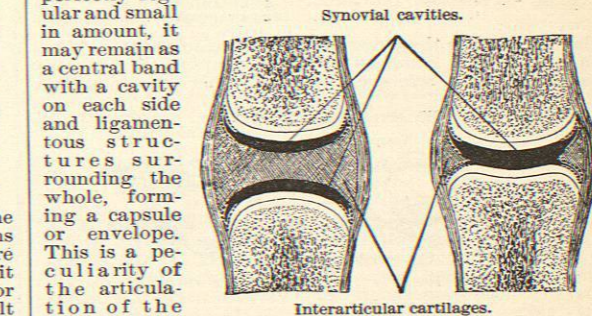


FIG. 335.—Formation of Arthrodial Joints.