in ten instances representing 1.3% of all pregnancies referred to the radiological department during 1956. The cleft is usually confined to the lumbar region. One further specimen was found in a series of 73 viable stillbirths. In every instance the child was a male. The normal proportion of ventral and dorsal ossification centres in foetuses before the 28th week of gestation is 33%, with no obvious male bias. It is suggested that the presence of the condition, which has no pathological importance, may be used as an aid in determining the sex of the foetus.

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RHEUMATOID ARTHRITIS OF THE CRICO-ARYTENOID JOINTS*

BY

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Rheumatoid arthritis has been described affecting almost every diarthrodial joint in the human body This process must almost certainly sometimes include the crico-arytenoid joints, which although small are extremely mobile and are used not only in phonation but also in normal full respiration. It is strange, therefore, that no article in the English language appears to have been written on this subject, although isolated reports, mostly in European journals, exist, and casual reference to such a condition can be found in some otolaryngological textbooks.

The Crico-arytenoid Joints

The cricoid cartilage is the uppermost ring of the trachea. This, unlike its fellows, has a flat expansion posteriorly which is called the lamina, which makes it similar in shape to a signet ring. On each of the two upper and outer curved edges of the lamina is situated a pyramid-shaped cartilage—the arytenoid—which looks rather like a miniature adrenal gland standing on its kidney. The joints by which these structures are attached to the laminal facets are surrounded by a fibrous capsule with ligamentous reinforcement posteriorly and are lined with a normal synovial membrane.

The vocal cords are attached from the outer side of each of the arytenoid cartilages to a common insertion on the internal surface of the thyroid cartilage where this overlaps the front of the cricoid cartilage. Voluntary variation in the position of the vocal cords is produced by the various movements of the crico-arytenoid cartilages. Their repertory includes rotation and gliding movements both forwards and backwards as well as medially towards their fellow. Involuntary widening of the aperture between the cords occurs during full inspiration, and the reverse in expiration.

The muscles which control the movements of the crico-arytenoid joints, and so of the vocal cords, are all innervated by the recurrent laryngeal branch of the vagus nerve. Unilateral paralysis of this, which is not very uncommon from both local and general infections or traumata, leads to hoarseness but not to loss of voice, as the normal cord moves across towards the one affected to compensate. If the nerve on both sides is paralysed, however, the vocal folds remain fixed in the half-way position, causing loss of voice and stridor on deep inspiration. The crico-arytenoid joints, since they are not structurally affected, can generally, in these circumstances, be moved passively with a laryngeal spatula without pain.

Symptomatology

It has been observed that in certain cases of rheumatoid arthritis acute exacerbations of the general joint disease are associated with a period of hoarseness and a feeling of tension in the throat which is often increased by swallowing, speaking, or coughing. Local tenderness on pressure over the larynx between the thyroid and cricoid cartilages, laterally or centrally, is also sometimes present. These attacks pass off when the general activity of the arthritis lessens, and are generally ascribed to intercurrent colds or laryngitis. When in the course of time the disease becomes chronic a permanent huskiness of the voice may remain.

It seems reasonable in retrospect to suspect that there may exist some causal relationship between the variations in the general joint condition and these laryngeal abnormalities.

There appears to be no reason why rheumatoid disease may not affect the crico-arytenoid joints in similar fashion to other larger diarthrodial joints of the body. If this is so we should expect to observe cases which exhibit phases of recurrent acute or subacute inflammatory reaction either confined to these joints or, more probably, as part of a generalized arthritic process. In the later chronic stages of the disease, and usually as the sequel to recurring episodes of this nature, more permanent impairment of movement or even ankylosis of the crico-arytenoid joints might occur.

The following cases of rheumatoid arthritis have been selected as probable examples of these three phases of crico-arytenoid joint involvement.

Case 1

Acute recurrent attacks of hoarseness and slight dysphagia which were associated with recurrent exacerbations of generalized polyarthritis.

The patient was a colonial bishop, aged 60, who spent much time travelling through difficult tropical country under conditions involving considerable privation and great fatigue. Five years previously these periods of exhaustion had become associated with painful swelling of the fingers and wrists, and later considerable pain and stiffness in the cervical spine. All this would at first die down after a few days' rest, but the free intervals between these episodes became progressively shorter. For the last three years permanent changes in the hands, typical of rheumatoid arthritis, had been unmistakable. Associated with these periods of active arthritis for the past two years had been temporary hoarseness of voice, without sore throat, although sometimes with dysphagia, which would get worse towards evening. He would then sometimes lose his speaking voice. He received no special treatment for the arthritis except aspirin in rather large dosage. Penicillin and other antibiotics were administered on several occasions for the "laryngitis," but proved ineffective. On one occasion he developed a mild upper respiratory infection which much exacerbated this condition, and stridor temporarily developed which almost necessitated tracheotomy. These attacks of hoarseness

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eventually became very frequent and speaking loudly was painful. It thus became impossible for him to preach, and he returned to England.

When seen he showed unmistakable signs of chronic rheumatoid arthritis of moderate intensity. There was tender fusiform swelling of most of the fingers, early ulnar deviation of the hands and wrists, whilst flexion of the neck produced considerable pain. There was loss of weight, but there were no signs of disease of other systems, and the chest *x*-ray picture was normal. His haemoglobin was 70%, E.S.R. 50 mm., and all agglutination reactions and the Wassermann reaction were normal. Hoarseness of voice was still present, but not marked in ordinary conversation.

On direct laryngoscopy the left vocal cord was reported as not moving well. A periarthritic reaction was seen to be confined to the arytenoid and post-cricoid region with secondary muscle implication. Pain was elicited on the attempt to manipulate the left arytenoid cartilage, but not on the right. The patient's general condition and polyarthritis during the next six weeks responded well to rest, splintage, analgesics, and injections of gold salts; local short-wave diathermy had been applied to the crico-thyroid region. The appearance of the larynx was then reported as normal, no pain being elicited on forced movement of the crico-arytenoid joints on either side.

He wrote nearly two years later stating that no further attacks of hoarseness had occurred although the arthritis of his peripheral joints remained periodically mildly active.

Case 2

Mild attacks of hoarseness in the course of exacerbations of a rheumatoid arthritis of moderate intensity.

The patient, a woman aged 54, had suffered for seven years from rheumatoid arthritis affecting the hands, wrists, feet, knees, and cervical spine. During the last two years she had complained of attacks of hoarseness with slight cough every few months and lasting one to three weeks. On exertion she suffered slight dyspnoea also and sometimes some stridor. These were usually diagnosed as "laryngitis" until she herself noted their association with the periodical increased pain in the affected peripheral joints. An *x*-ray examination of her chest showed nothing abnormal, and no glandular enlargement or other signs or symptoms of disease of other systems were found. She had not received metallic therapy. Her haemoglobin was 78%, E.S.R. 25 mm., and white-cell count normal.

Laryngological examination during one of the periodical attacks of hoarseness was reported as showing oedema of the pre-arytenoid area. The left vocal cord was fixed in the position of abduction. The crico-arytenoid joint on that side, but less so on the other, was painful on gentle manipulation and probing with a spatula.

Case 3

Probable ankylosis of both crico-arytenoid joints in a patient with long-standing chronic rheumatoid arthritis.

A woman aged 70 had suffered with rheumatoid arthritis of varying intensity over a period of twenty-five years. The arthritic condition had been much exacerbated after a road accident ten years previously in which, however, she had not herself been physically injured. Soon after this, hoarseness of voice developed, at first intermittently and for the last four years permanently. She spoke in a husky whisper, and slept propped up, as inspiratory stridor developed when lying flat. There was occasional pain on swallowing. At first hysteria was suspected, but later, when pain began to be referred behind the ears, she was examined laryngoscopically, the report stating that marked redness but very little swelling was noted in the crico-arytenoid area. The vocal chink was narrowed, and only slightly increased widening, due to bowing of the cords, occurred with full inspiration. The arytenoid cartilages were both fixed, and attempts to move them in any direction were unsuccessful and very painful. The aryepiglottic folds appeared lengthened, and there was tenderness on lateral pressure over the cricoid space.

Ultimately the patient became bedridden. The condition of the larynx remained unchanged subsequently in spite of considerable temporary improvement in many of the peripheral joints which took place as the result of the administration of cortisone for a few weeks.

Differential Diagnosis

The differential diagnosis in these and similar cases would appear to lie only between rheumatoid arthritis involving the crico-arytenoid joints and paralysis of the recurrent laryngeal nerves in rheumatoid subjects due to some unknown local or general cause of which no evidence can be found. The distinction, which can finally be made only by a laryngologist of experience, remains difficult and perhaps uncertain. Recurrent paralysis of other peripheral nerves in association with exacerbations of rheumatoid arthritis has not, however, been recorded. It seems therefore probable that the local laryngeal signs and symptoms in such cases are evidence of implication of the crico-arytenoid joints in the generalized rheumatoid inflammatory reaction which is affecting other joints in the body.

Summary

It is suggested that in the course of rheumatoid arthritis involvement of the crico-arytenoid joints may sometimes occur as an integral part of the polyarthritic process.

Three cases are quoted which are believed to demonstrate varying stages in this syndrome—namely, acute and subacute recurrent laryngeal episodes, and complete ankylosis of both crico-arytenoid joints in the final stage of rheumatoid disease. Operative procedures did not prove necessary in these cases.

ADDENDUM.—Since the above was written Pearson (1957) has described a case of rheumatoid arthritis of 30 years' duration in a patient who developed increasing huskiness and dyspnoea on exertion. This became worse, and laryngeal obstruction was diagnosed, for which tracheotomy was performed. The patient died later, and necropsy showed changes in the crico-arytenoid joints characteristic of rheumatoid arthritis.

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Discussing changing attitudes to the handicapped child, Dr. J. D. KERSHAW (*Public Health*, May, 1957, p. 57) remarks that few individual special schools are big enough to offer training for more than three or four crafts, and he advocates centralization of vocational training in large residential technical schools, where the range of training could be wider. Another point stressed by Dr. Kershaw is that there is still a failure of co-operation between the hospital and school health services over handicapped children. It is the exception to find the hospital physician or surgeon and the school medical officer planning together for the child's future. Often the hospital makes no contact with the school health service until the child's treatment has been completed. By contrast, Dr. Kershaw writes, there are some areas where the hospitals have voluntarily adopted what almost amounts to notification to the school health service of all potentially handicapping defects as soon as they are detected.