The whole subject of the leukæmoid reaction is a difficult one, and there would seem sometimes to be no strict dividing line hæmatologically between it and the leukæmias. As an additional complication, leukæmic patients are prone to develop pulmonary tuberculosis.

I would like to thank Drs. Maurice Davidson, E. R. Cullinan, R. Bodley Scott, J. G. Scadding and R. M. B. MacKenna for allowing me to record their cases.

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A Ten-Year Follow-up of Peptic Ulcer Cases with Special Reference to Results of Medical Treatment [*Abstract*]

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356 proven cases of peptic ulceration which had been admitted as in-patients to Addenbrooke's Hospital during the years 1934–38 inclusive were followed up in 1948–49. Of the total, 142 had died, 195 were traced, and 19 were untraced. Of those traced 96 gastric and 43 duodenal ulcer cases had been treated by medical means alone with or without the simple suture of a perforation. At follow-up 42 (44%) of the 96 gastric and 14 (32·5%) of the 43 duodenal ulcer cases were inactive and had been free from symptoms for the previous five years. After full enquiry into the regimen of treatment which had been followed by each patient during the follow-up interval it was concluded that medical treatment had not influenced the natural course of the peptic ulcers. For a full account of the whole survey *see* Martin, L., and Lewis, N. (1949) *Lancet* (ii), 1115.

The Respiratory Factor in Ankylosing Spondylitis

By F. DUDLEY HART, M.D., F.R.C.P.

Middle-aged man; complaining of breathlessness on exertion. After X-ray examinations and investigations he was diagnosed as a case of emphysema. But on his third attendance at hospital he was correctly diagnosed by an assistant, who had also worked in the Rheumatism Clinic, as a case of ankylosing spondylitis.

History.—In the trenches in the first World War in 1916 when a young man in the early twenties, the sudden onset of severe low backache led eventually to his discharge from the Army as a case of fibrositis of the back in a man of poor moral fibre. Since then backache and spinal stiffness relapsed and remitted, with the condition gradually worsening until he was seen by us thirty-three years after the onset of the condition. It was at this time that the diagnosis of ankylosing spondylitis was first made. His fixed, bent back and chest expansion of ¼ in. made a typical picture.

Ankylosing spondylitis starts insidiously, usually in the lower spine, and the sacro-iliac joints are early affected. Nevertheless, by the time the patient comes to hospital, there is usually limitation of thoracic expansion, measurements of chest expansion at nipple level being reduced to 1 in. or less, the vital capacity significantly reduced by 20–40% of the normal figure for that subject. In a recent enquiry at Westminster Hospital it was found that of 62 patients with ankylosing spondylitis, 46 (74%) had experienced tightness and discomfort in the chest wall on deep inspiration at some time after the onset of the disease. Only 8 (13%) had never experienced these symptoms at any time since the onset of their spinal condition. 8 (13%) had noticed these symptoms only slightly and intermittently. In a few cases these symptoms dominated the picture from the first. In the cases we have seen there has been significant reduction in chest expansion in 3 out of 5 patients in cases of duration

varying from a few months to thirty-three years. It is not a late finding only, it is usually present at the patient's first attendance at our Clinic.

Underlying pathology.—Every thoracic vertebra has eight articular facets—intervertebral superior and inferior right and left, costo-vertebral and costo-transverse (Fig. 1). All these may be affected, though commonly the involvement is a patchy and irregular one. The result is pain and limitation of costal movement in the earlier stages, complete fixity with bony fusion in the late stages of advanced cases (Figs. 2 and 3). Respiration is largely diaphragmatic (Figs. 4, 5 and 6). The patient complains of stiffness and immobility of the chest wall, inability to take a deep breath, and not infrequently tenderness in sternum and/or ribs. This last complaint was present at some stage in two-thirds of our 62 patients. Inflammatory changes in the spine may be referred to points lower in the chest or to the flanks and abdomen, simulating the girdle pains of other diseases. Exertional dyspnœa may be caused, though other factors, e.g. hip involvement, may limit exercise capacity and render exertional dyspnœa unlikely, or impossible. It is not uncommon for thoracocervical kyphosis to give a hang-dog appearance to these patients, but this factor is absent in many, and probably does not affect vital capacity greatly unless this deformity is marked. In 7 normal students Dr. Keith Robinson found little effect on vital capacity by taking estimations in equivalent positions of kyphosis (Table I). Such deformity, if marked, will certainly play a part in restricting thoracic movements and diminishing vital capacity, but this factor probably is not an important one in the average case as compared with involvement of rib or intervertebral articulations.

TABLE I

Subject	Vit. cap. in c.c.	90 degrees flexion of trunk	Full cervico-dorsal flexion	Half-way position
J. B.	5,300	5,200—98%	4,600—87%	5,000—94%
A. D.	5,000	4,900—98%	4,000—80%	4,300—86%
P. G.	4,400	4,200—96%	3,800—87%	4,100—93%
H. C.	5,200	5,200—100%	4,400—85%	
J. B.	3,800	3,800—100%	3,200—84%	
D. D.	4,300	4,100—95%	3,600—84%	3,800—88%
A. B.	5,500	5,400—98%	4,500—82%	5,100—93%

Thoracic pain may be a striking symptom in this disease. One man, 37 years of age, was admitted to hospital with a five months' history of aches, pains, stiffness in the lower thoracic spine and across the shoulders. Two months after the onset of these symptoms lumbar pains and stiffness of the back made their appearance, together with a tight constricted feeling in the chest. He felt he could not fill his lungs properly. He was admitted to hospital in great pain, unable to bend his back at all or lie comfortably in bed in any position, and he was unable to take deep inspiratory efforts because of the severe painful constricted sensation in the chest wall. Analgesics gave only partial and temporary relief. Chest expansion was under 1 in. at nipple level, vital capacity 56% of normal. On deep X-ray therapy to the spine, 1,200 r to three ports, the pain abated. Improvement was noted after the second application to each field. After the completion of the course vital capacity had risen to 80% of normal; a few months later to 110% of normal, his chest expansion to 3 in. A second case, a man aged 50, was admitted with pyrexia and severe constricting pain in the chest of four months' duration. He had a history of backache going back four years. The same picture of painful restlessness with inability to find a comfortable position in bed was noted, the combination of stiffness, pain and constricted thoracic sensation producing marked distress and making nursing very difficult. X-rays showed a more advanced spinal condition than in the first case, but relief of the severe symptoms was obtained within seven days of the start of deep X-ray therapy.

In such severe cases with the thoracic discomfort predominating, deep X-ray therapy appears to give greater relief than any other measure.

A third case may be quoted at this point.

A man aged 50, previously well and extremely fit, noticed in August 1948 stiffness of the spine and cough with shortness of breath. Stiffness was most marked in the lumbar region but later involved the neck. He was admitted at this time to a hospital overseas and as he was found to have ankylosing spondylitis was treated on constant bed rest. In October 1948, approximately a month after admission to hospital, sudden onset of pain and dyspnœa occurred due to right-sided spontaneous pneumothorax. Aspiration of air was carried out. As the pneumothorax failed to expand a right phrenic crush was attempted, happily only the sympathetic nerves of the area were avulsed, giving him a right-sided Horner's syndrome and leaving his diaphragm unaffected. He returned to England at the end of the year and came under our care in March 1949. He was a typical spondylitic. There was moderate thoracic kyphosis with the head held rigidly forward. The lumbar spine was flattened and all spinal movements severely restricted. All peripheral joints were normal. He was tender over the last ribs on both sides. His chest expansion was ¼ in. Signs were present of a right pneumothorax. X-rays showed a right pneumothorax with adhesions at the apex; no fluid was present. There was a little old tuberculous infiltration at the left apex. Diaphragmatic movement was full; no rib movement was present. Advanced ankylosing spondylitis was seen in sacro-iliac joints, dorsal and lumbar

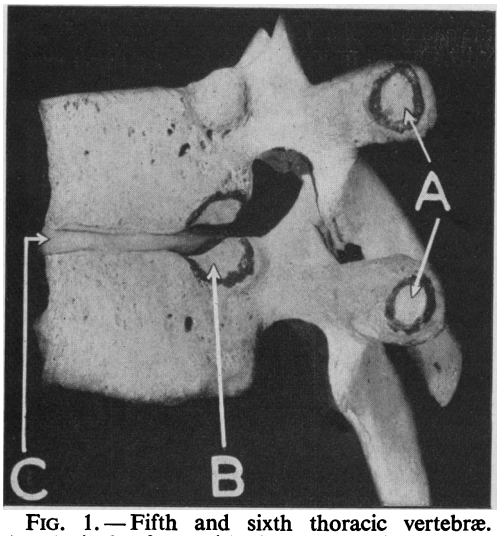

FIG. 1.—Fifth and sixth thoracic vertebræ. A.—Articular facet with ribs. B.—Articular facet of rib with adjacent vertebræ. C.—Intervertebral disc. Involvement of A and B causes pain and fixation of rib on vertebral column.

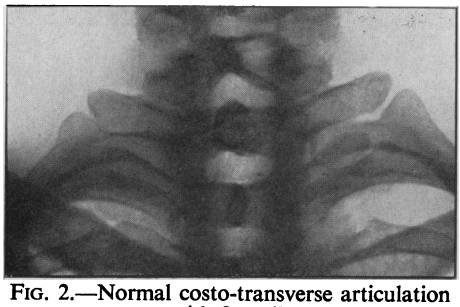

FIG. 2.—Normal costo-transverse articulation with first rib.

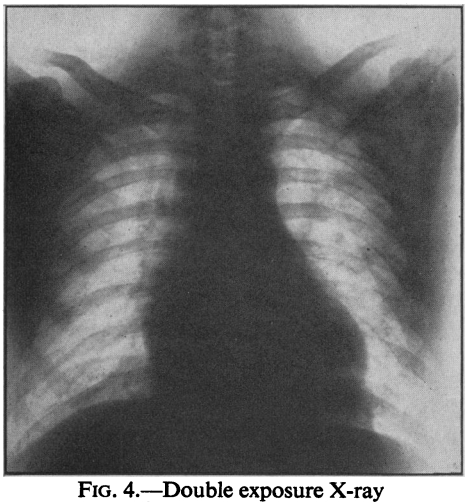

FIG. 4.—Double exposure X-ray in normal subject.

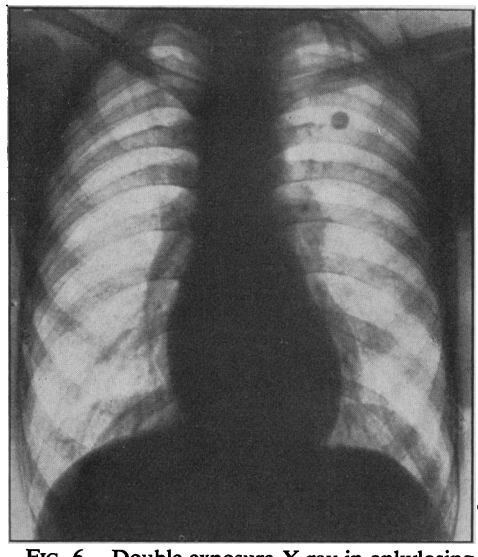

FIG. 6.—Double exposure X-ray in ankylosing spondylitis. Rib movement is slight, diaphragm excursion is normal.

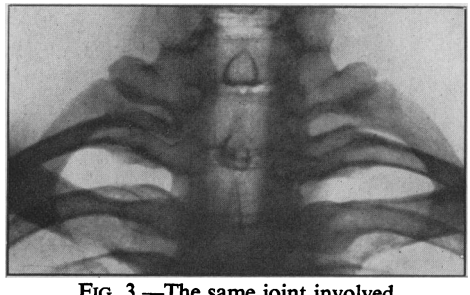

FIG. 3.—The same joint involved in ankylosing spondylitis.

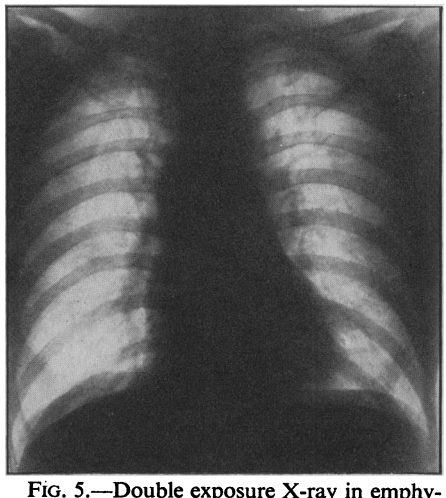

FIG. 5.—Double exposure X-ray in emphysema. Rib movement is not apparent; diaphragmatic excursion minimal.

spines. Vital capacity was 38% (1,700 c.c.). On deep X-ray treatment, accompanied by breathing exercises and the freedom of not only the ward but the entire hospital for the encouragement of full bodily exercise, his spinal condition improved markedly, but the pneumothorax only partially, and now, eight months later, this is still present.

This case-history shows the importance of exercise in general, and breathing exercises in particular. Immobility, particularly in plaster beds or jackets, hastens fusion of the chest wall and lowers the vital capacity markedly, the chest becoming fixed in the position of rest. Advanced cases of ankylosing spondylitis are almost completely dependent on their diaphragm for respiration, and one shudders to think what might have happened had the diaphragm been paralysed in the last case quoted above. If operations are necessary in such cases, the anæsthetist should be fully aware of the dangers, post-operative treatment must be carefully supervised, and early mobility and breathing exercises instituted. Such patients should be the minimum time in bed.

I have had 5 cases of ankylosing spondylitis who had also pulmonary tuberculosis. In each case the spinal condition preceded the pulmonary one. The therapeutic problem is here a difficult one as the two treatments are opposed—rest for the pulmonary tuberculosis, mobility and deep X-rays, postural and breathing exercises for the spondylitis. The maximum mobility possible should be allowed such patients, who on resting feel their spinal condition worsening in fixity, pain and forward curvature. Every effort should be made to prevent spinal deformity by correct posturing; the patient should not be allowed to become bent forward on a pile of pillows. Some substance, such as ACTH or Compound E (Kendall) (Cortisone), known to be effective in ankylosing spondylitis, may help in such difficult cases in the future; at present the combination of the two diseases is a therapeutic nightmare.

In 62 cases of ankylosing spondylitis we have enquired as to increasing incidence of coughs, colds and respiratory complaints. This enquiry has not revealed any particular predisposition to these complaints since onset of the spinal condition.

The symptoms resulting from restricted respiratory movement of the thoracic wall by ankylosing spondylitis are easily distinguishable from the dyspnœa of cardiac or pulmonary disease, the essential differentiating features in ankylosing spondylitis being:

(*a*) Spinal rigidity with absence or diminution of spinal extension.
(*b*) Diminished chest expansion with no physical signs in lungs.
(*c*) Chest is fixed in partial expiration, i.e. the position of rest, rather than partial inspiration as in emphysema or bronchitis.
(*d*) Absence of bronchial spasm and cough.
(*e*) Occasional tenderness on percussion over the sternum, and less commonly the adjacent costal cartilages and the lower ribs.

SUMMARY

Involvement of costo-transverse and costo-vertebral articulations in the rheumatoid process, known as ankylosing spondylitis, causes diminution in chest expansion and thoracic pain, sometimes severe. In the early stages limitation of thoracic expansion is due to pain arising at the costo-vertebral and costo-transverse joints; later bony ankylosis leads to a fixed chest. Spinal rigidity with loss of spinal extension on deep inspiration is a contributing factor. Spinal kyphosis, if extreme, adds to respiratory disability. Thoracic pain and exertional dyspnœa, so caused, may be erroneously attributed to cardiac or pulmonary disease unless other signs of ankylosing spondylitis are noted.