

DEXTRO CARDIA.

Two Cases
with
Comments
by

CHARLES HAROLD JOHNSON

M.B. C.M.	Edin ^r : 1896.
F.R.C.S.	Edin ^r : 1900.
M.R.C.P.	Edin ^r : 1901.



Dextro Cardia.

Several cases of this very interesting Pathological condition having come under my observation, I have been led to a closer study of the Subject and have embodied this work in the following thesis.

DEFINITION.

Any displacement of the heart with its apex to the right of the mesial plane and with rotation of the viscus on its antero-posterior axis, comes under the designation of "Dextro-Cardia".

CLASSIFICATION - on an Etiological basis.

A study of recorded cases readily suggests subdivision into two great groups, viz:-

1. Congenital.
2. Acquired.

The Congenital cases may again be subdivided into:-

A. Simple, i.e. a transposition of the viscus (heart), unaccompanied by displacement of other organs.

B. Complicated, i.e. in association with transposition of other viscera.

2. The acquired cases may be subdivided into three classes, viz:-

A. Traumatic, - of which very few are on record, the vast majority of acquired conditions coming under Classes B and C of this subdivision.

B. This class contains those cases associated with pathological conditions of the Right Thorax, the best example being Fibroid Phthisis;

C. While under C Class we have those cases associated with pathological conditions of the

Left Thorax, and as an example, pneumothorax may be cited.

To illustrate this method of Classification I give the following examples of recorded cases under their appropriate headings, i.e.

I. Congenital.

A. Simple.

i. Dr Charles Pope's Case
(Lancet. 2/82. p9.)

ii. Prof. Grunmach's Case.
(B.M.J. I/90. p 1441.)

B. Complicated.

i. Dr E. Parker's case c̄ P.M.
(Lancet. I/61. p 630.)

ii. Dr Moxon's case.
(Lancet. II/76. p 749.)

iii. Mr Treves F.R.C.S.
(Lancet. I/90. p 664.)

iv. Dr Haddon.
(Lancet. II/90. p 1156.)

2. Acquired.

A. Traumatic.

i. Dr Tibbitt's case due to blow.
(Lancet. I/76. p 598.)

ii. Dr Stokes' case due to crush.

(Anolamile and Curiosities of
Medicine by Gould and Pyle,
page 626.)

B. Complicated with Disease of Right Thorax.

i. Case No I. illustrates this class.

(Vide below.)

ii. Case No 2.do.....

(Vide page 19.)

iii. Two cases by Dr Alex M. McAldomie.

(B.M.J. 2/- p 156.)

C. Complicated with Disease of Left Lung.

i. Dr Douglas Powell's case. Increase
due to intrathoracic pressure on
left side with collapse of lung.

(Lancet. I/78. p 157.)

Case I.

The first case of this interesting pathological condition that came under my notice was that of a man, D.C., residing in the High Riggs, Edinburgh, and his condition was as follows.

D... C....., a man 5 feet 6 inches in height and 67 years of age, was to trade a blacksmith, though, after spending many years at this calling, he was some years ago compelled to make a change in his occupation and chose that of "travelling draper." This latter occupation he was compelled to give up **seven years ago** owing to breathlessness caused by exertion in the pursuit of his new calling.

D.. C.. was born in Fife, where he spent his early life, but, finding his employment becoming too hard for him, he moved to this City, and applied himself to the drapery business, as before mentioned.

D.. C.. at last became alarmed at his repeated attacks of dyspnoea after even slight exertion, and decided to see a Medical man. He made a visit to the Royal Infirmary seven years ago, and consulted the late Professor Sir Thomas Crainger Stewart.

The history of the present illness begins in a series of more or less severe attacks of bronchial catarrh some years previously to his visit to the Royal Infirmary in 1894, but no definite date as to the actual beginning of the trouble can be given. It may therefore be said that the origin of the disease was insidious, beginning several years before he sought help at the Royal Infirmary. These early and neglected 'colds' give, I believe, a very important clue to the causation of "Dextro-Cardia" in this case, as I shall afterwards try to prove. When admitted to the Royal Infirmary in 1894, the patient was found to be suffering from Phthisis Pulmonalis of the base of the right lung, but no mention of his heart condition was made.

After being treated for about three weeks, D..C.. decided to leave the hospital and did so on his own account. He states that he made great improvement while in hospital, and, after leaving, he felt quite well except that he was troubled with coughing at times and slight dyspnoea. D.C. states that he has always been a moderate man both as regards food and drink, though his appearance indicates some indulgence in the latter of late years.

Of the family history of my patient I can obtain

but little information, except that his father died in old age of cerebral haemorrhage, and his mother of dropsy, probably of cardiac origin. D. C. had two sisters, both of whom are dead - one of phthisis, the other of cerebral haemorrhage. An only brother died of jaundice early in life. No ages at death could be ascertained.

The present condition of my patient is very interesting and I hope not only to prove the nature of his trouble, but to throw some light on the causes which brought it about.

D. C. is about 5 feet 6 inches in height, is of slim build, and though somewhat emaciated is of a cheerful disposition. He is both able and willing to carry on any light employment he can obtain. At present there is the usual diurnal variation in temperature, but no nightly rise. Enlarged veins are noticeable coursing beneath the skin in several parts of the body, notably in the temporal regions, but also over the thorax and abdomen. The long Saphenae are only slightly more prominent than usual.

The blood glandular system shows no evident changes.

The chief point of interest in this case being in connection with the Circulatory System, I propose to carefully study that System in the first place, and then to take the Respiratory System, since it appears to me that the circulatory disturbance has been brought about by a chronic affection of the right lung. The above arrangement will, I think, bring out more clearly the prominent features of the case and the cause or causes bringing about the condition.

D. C.'s first complaint referred to the Circulatory System in the form of dyspnoea and coughing on exertion, with occasional faintness.

The pulse wave was 70 per minute, regular both in time and force, and of medium fulness. The arterial tension was not increased. The vessels at the wrist were only slightly thickened, and not beyond what might have been expected from the age of the

individual.

Radial pulses were equal in time and force.

On inspecting the precordia there was noticeable bulging of the thoracic wall to the right side of the sternum, and some flattening over the normal precordial area. While palpating the thorax to the left of the sternum, vocal fremitus could be distinctly felt over the area usually occupied by the heart, but no evidence of a cardiac impulse could be detected. Further inspection showed distinct wavy movements in the intercostal spaces around the right nipple and the nipple itself was observed to be thrown forcibly outwards from the chest wall at each cardiac impulse. On palpation of this region, a distinct cardiac impulse was felt.

Percussion of the precordia showed the region to the left of the sternum usually occupied by the heart, quite resonant as compared to what it usually is with the heart in its normal place. This resonant note on percussion of the normal precordia, was not due to emphysematous lung covering the heart anteriorly, as I hope to show when studying the Respiratory System.

On percussing to the right of the sternum a large area of absolute dulness was noticed. It extended from the 2nd costal cartilage outwards to one inch beyond the nipple, and there became continuous with the dulness of the base of the right lung and liver dulness.

On auscultation at the point previously referred to as under the right nipple, the mitral valve sound could be readily made out. A second cardiac sound could be distinctly made out behind the sternum and along the right border, opposite the interspace between the 4th and 5th costal cartilages. The aortic sound was heard most distinctly behind the 3rd right costal cartilage, at its junction with the sternum. The cardiac sounds were quite normal, and free from all trace of bruits. No sound could be heard to the left of the sternum.

The general circulatory system showed no change, beyond the varicosities mentioned.

Coming now to the Respiratory System, we here find practically the same subjective symptoms complained of viz, cough and dyspnoea. It was owing to these symptoms that D. C. first sought medical aid at the Royal Infirmary in 1894, and became aware of the true nature of his illness. Pain seems to have been altogether absent, even from the beginning of the illness, contrary to what one might expect from a physical examination of the man's lung and pleura to-day.

The cough, which has been present from the very first still persists. It of course varies much, sometimes being slight, while at other times it is more troublesome. The sputum has never been copious nor has the patient ever suffered from hæmoptysis, yet the presence of numerous tubercle bacilli in the sputum - demonstrated by both Grams and Ziel-Nielsen Methods - stamps the case as one of pulmonary tuberculosis.

The dyspnoea is evident after very slight exertion such as conversation. The breathing also becomes very noisy, and bubblings can be heard some little distance from the chest wall.

On inspecting the thorax, the difficulty that the patient experiences in breathing is rendered very evident by the exaggerated manner in which the extraordinary muscles of respiration are brought into play.

The thoracic parieties are very much emaciated below the clavicles, but not above. The Supra-clavicular regions on both sides are well developed. The intercostal spaces are deepened owing to the atrophy of muscle. On the right side of the sternum, there is the bulging of the parieties, and on the left, slight flattening as described when speaking of the precordia. On the right side the intercostal spaces immediately above and below the nipple are much drawn in during respiration. This is not to be seen over any other part of the thorax.

Respiratory movements vary from 20 to 25 or even more, varying with the amount of exertion the patient has been put through. In type it is thoracico--abdominal with exaggeration of the thoracic element.

Vocal fremitus cannot be detected over the lowest part of the right lung, but is exaggerated over the lung above this. On the left side, the vocal fremitus

is also unusually well marked.

Percussion gives a large area of absolute dulness over the region occupied by the heart to the right of the sternum from the 3rd right costal cartilage to immediately above the right nipple, and outwards. The upper part of the right lung showed dulness not nearly so marked. The lower part of left lung was however on percussion, shown to be duller than usual, while the upper part was hyper-resonant.

On auscultating the lower part of the right lung, no respiratory murmurs could be made out. Above the 4th rib (right) the respiratory murmurs were quite distinct, The expiratory murmur was prolonged, a few moist sounds accompanying and the type was distinctly bronchial. Vocal resonance in the lower part of the lung was distinct, while it was marked in the upper part. The same condition was found on examining the lung from behind. The left lung on auscultation showed prolonged expiration, was of bronchial type, and there were also a few moist rales. Vocal resonance slightly increased in the lower part below left nipple, and over normal precordial region. The upper part of the left lung, both in front and behind, showed

but slight change from the normal, beyond prolongation of expiratory murmur.

The larynx showed no change from the normal.

The digestive, genito-urinary, and nervous systems showed no morbid change.

COMMENTARY.

-----0-----

In this case the history undoubtedly points to disease of the Right Lung, at a time long before any alteration in the position of the heart was observed, and, it is not possible, that such a competent observer as the late Sir Thomas Grainger Stewart could have failed to notice the displaced condition of the heart as now seen, had it been present when the patient was under his care seven years ago in the Royal Infirmary. It can therefore be very reasonably put down, that the heart has acquired its new position and precordia as noticed, during the last seven years.

The question as to how this transposition of the

heart was brought about can have in my opinion, but one explanation. A slowly spreading fibroid inflammation of tubercular origin attacked the base of the right lung, the pleura becoming affected, primarily or secondarily, by adhesive pleurisy of the same type. The base of the right lung being fixed all round by the adhesive pleurisy, accompanied by or followed by interstitial thickening with subsequent contraction of the newly formed fibrous tissue throughout the diseased base, has brought about shrinking.

The parietal pleura, being fixed all round to the visceral layer of the pleura covering the diseased base (in this case the right base) causes the Parietal Mediastinal layer - its most yielding part - to follow the shrinking and retracting lung.

Now, from the short description given of the anatomy of the pleura and pericardium, (vide page 25), it is quite evident, that that portion of the parietal layer of the pleura which is less fixed and most easily displaced is the mediastinal pleura which covers and is attached to the parietal layer of the pericardium; the costal pleura being firmly held in its place by its attachments to the unyielding costal arch. The

shrinking lung therefore drags the mediastinal parietal pleura towards the costal parietal pleura.

The ribs moving slightly inwards are caused to straighten somewhat, but the greater movement is on the part of the mediastinal pleura and pericardium. The pericardium and necessarily its contents being thus dragged to the right, dextro-cardia is produced. The slight yielding (straightening) of the ribs overlying the affected costal pleura to my idea gives a satisfactory explanation of the falling in of the lateral aspect of the thoracic wall (Right), and also to the prominence over the newly acquired precordia.

CASE NO 2.

Mrs B. a married woman, thirty years of age, residing at Joppa, was admitted to the Royal Infirmary ten years ago, suffering from Pleurisy of the right side. Three weeks later the patient had severe haemoptysis. After a prolonged stay in hospital, the patient was able to return to her home, much improved in her general health. During the succeeding years, up to 1898, the patient had several attacks of haemoptysis, followed by a general depressed condition and ill-health. During the Summer of 1898 Mrs B. consulted Dr Veitch of Gilmore Place, when she was informed that both lungs were affected with tubercular disease - the right severely so. The instructions given by the Dr were practically those of open air treatment to be carried out in her own home. Shortly afterwards, falling pregnant, she again consulted her medical attendant, who, taking into consideration the serious condition of his patient, recommended that the pregnancy should be brought to a close by artificial abortion. After consulting with Drs Philip and Brewis this was decided on, and successfully carried out. The rigid adherence to the fresh air treatment and forced

feeding has given great relief to Mrs B. who describes herself as in excellent health. The patient tells me, that her Dr first drew her attention to the change of position of her heart last September.

The present condition of Mrs B is that of a well developed and well nourished woman, about 30 years of age. Her height is 5 feet 4 inches, and her weight 8 stone. This is the heaviest weight attained at any time by the patient. Mrs B is very cheerful, and takes a great delight in doing the work of her home, and indulges in as much outdoor exercise as the weather will permit. There is no evening rise in temperature in this case, as one might expect.

Mrs B has a fine skin, and several veins somewhat enlarged, are distinctly noticed over the thorax. There is no lividity, and no clubbing of the fingers present.

In the Haemopoetic system, the blood shows some increase in the number of leucocytes. There is no enlargement of the cervical or other lymphatic glands. The Thymus and Spleen are quite normal.

The Circulatory System shows very closely those conditions mentioned in Case I.

Beyond pulsation under the right nipple, and slight palpitation also referred to that spot occurring after much exertion, little has been noticed by the patient.

The pulse waves are 70 per minute, regular both in time and force and of moderate strength. Radial pulses are synchronous and the vessel walls show no signs of degeneration.

Inspection of the normal precordia shows no apex beat or rather cardiac impulse, but, under the right nipple and a little internal to it a distinct impulse can be seen. The aortic region, and great vessels of the neck show no changes from the normal and give no indication of aneurism.

Palpating the precordia (normal) there is no evidence of a cardiac impulse. No cardiac movement can be ascertained at all in the region normal to the cardiac impulse, but, on palpating to the right of the sternum, the cardiac impulse can be distinctly felt on a level of the right nipple, and a quarter of an inch

internal to it.

By Auscultation no cardiac sound can be heard, to the left of the sternum, but on auscultating to the right of the sternum, the 1st sound can be distinctly heard over the position of the apex beat. At the junction of the 5th right costal cartilage with the sternum the tricuspid sound can be distinctly heard and also behind the adjoining sternum. The aortic sound can be made out at the junction of the 3rd right costal cartilage and the sternum. The pulmonary, behind the sternum at this level. The sounds are absolutely normal, and free from murmurs.

The normal precordia (to left of sternum) is quite resonant on both superficial and deep percussion, but on percussing to the right of the sternum there is a large area of absolute dulness, extending from the 3rd right costal cartilage to a point immediately internal to the right nipple. Here the dulness (cardiac) becomes continuous with the dulness of the lower lobe of the right lung and liver dulness.

The general circulatory system shows no evidence of cardiac embarrassment at all, nor of any interference through the lung with the circulation, beyond

the varicosity of the veins of the thorax before mentioned.

In the Respiratory System, the subjective symptoms were slight dyspnoea on exertion, and some pain referred to the right base of the lung.

Coughing has been troublesome at times, but usually slight and now very little trouble arises from this cause. Expectoration has been free, especially when the haemoptysis was present. Microscopical examination here also shows the tubercle bacillus.

No pathological change can be detected in the left lung, but the right lung is slightly dull throughout. Bronchial breathing with bronchophony is fairly general, and crepitations can be heard here and there throughout the lung.

The lower lobe of the right lung is absolutely dull up to the 6th rib. All respiratory murmurs are abolished, vocal resonance is increased and vocal fremitus increased. The breathing throughout this lung is bronchial in character, and the expiratory sound prolonged, as is also the act.

The other Systems are normal.

COMMENTARY.

My diagnosis is chronic fibroid phthisis, chiefly affecting the lower lobe of the right lung, but throughout the whole of the right lung to a more or less extent, and consequent upon this, shrinking of the lung. Adhesive pleurisy had previously fixed the visceral to the parietal (costal) pleura on the one hand, and on the other, the visceral to the parietal layer covering the pericardium. The shrinking has resulted in drawing the moveable pericardial sac and contents to the fixed, and resisting thoracic wall.

Doubtless the compensatory expansion of the left lung contributed to this result. One has also to remember that the pericardial sac is suspended between the pleural sacs, so that any marked alteration of position of either pleural sac is bound to influence the position of the pericardium and its contents.

This explanation is given in much greater detail in the Commentary - vide page 15 et seq. - on Case I; and none other seems feasible. A consideration of the

following facts relating to the anatomy of the thorax
will, I think, bear this out.

SOME ANATOMICAL FACTS
RELATING TO THE
PERICARDIUM and PLEURA.
-----o-----

The Pericardium is a cone-shaped, fibro-serous sac, having its apex above at the base of the heart, while its base is attached to the central tendon of the diaphragm. The fibrous coat is strong, and non-elastic. Below, the serous sac is firmly attached to the central tendon of the diaphragm around the caval aperture, but elsewhere loosely. Above, the fibrous layers of the pericardium is reflected on to the great vessels (with the exception of the inferior vena cava) forming an extra fibrous sheath to those vessels.

Along the great vessels of the heart, this fibrous coat extends, and becomes continuous with the deep cervical fascia. The pericardium is attached to the posterior aspect of the sternum by two slender fibrous bands, the superior sterno-pericardial band and the inferior sterno-pericardial band,. The former is attached to the front of the pericardium at the base

of the heart on the one hand, while on the other hand, it is attached to the posterior aspect of the adjoining portion of the sternum. The latter crosses between the fibrous pericardium, and the posterior aspect of the sternum at the base of the cone-shaped pericardial sac.

Within this fibrous layer is the serous layer of the pericardium, covering both the viscus (visceral layer) and lining the interior of the fibrous layer (parietal layer) of the pericardial sac.

Within this sac the heart normally hangs freely, being suspended above by the great vessels of the heart, and also to a less degree by the attachments formed between the fibrous pericardial reflection along those vessels and the deep cervical fascia. Besides these attachments, we must take into account, that the fibrous layer of the pericardium is lined externally by the mediastinal pleura reflected on both sides from behind, from the posterior border of the pleural sac, which extends from the neck of the first rib to the neck of the 12th rib.

The Mediastinal Pleura is reflected on right side (anteriorly) to the posterior aspect of the sterno -

clavicular articulation, extending from that point downwards and meeting the sternum in mid line at the junction of the Manubrium and Gladiolus. From this it passes vertically downwards to the lower end of the Gladiolus.

On the left side, the Mediastinal Pleura normally is reflected from the posterior aspect of the Sternum at the level of the 5th chondral sternal articulation, and passed downwards and outwards behind the 5th and 6th ribs to the 7th costo chondral articulation, and from this point extends outwards as the inferior border. The Mediastinal Pleura becomes continuous with the Costal Pleura, posteriorly at the posterior border of the pleural sac, and anteriorly at the anterior border of same sac. Inferiorly, it is reflected on to the diaphragm (diaphragmatic pleura) and extends outwards, joining the costal pleura at the inferior border of the pleural sac.

On the right side, the inferior border of the pleural sac is formed by the reflection of the diaphragmatic pleura on to the internal surface of the ribs and intercostal muscles and subcostal muscles to join the costal pleura with which it is continuous.

This inferior border extends from the lower end of the gladiolus outwards and downwards behind the 7th costal cartilage to the 8th rib, reaching the lower border of the 9th in the mid-maxillary line and from here extends backwards over the 10th, 11th, and 12th ribs to become continuous with the posterior border.

On the left side the inferior border is at a slightly lower level, reaching the lower border of the 10th rib in the mid-axillary line.

Above, the Mediastinal Pleura passes into the cervical pleura, and becomes attached to the deep cervical pleura by means of Sibson's fascia (band).

The lung normally lies within and completely fills the pleural cavity except a small portion of the lower pleural sac, being covered with its visceral layer of the pleura reflected over the root of the lung. The Ligamentum Latum Pulmonis forms an attachment between the root of the lung and diaphragm, being simply a reflection of the pleura between these parts.

From the anatomy of the Plurae and Pericardium, we notice, that the pericardium is further kept in its **normal** position by the attachments of the mediastinum

pleura to the diaphragm below, to the deep cervical fascia above, through Sibson's fascia and anteriorly to the reflection of the mediastinal pleura along its anterior border, and lastly posteriorly to the reflection along the posterior border.

The Ligamentum Latum Pulmonis also plays a part in keeping up the normal position of the pericardial sac though of less importance.

-----o-----

Referring to the definition of 'dextro-cardia' it is evident that something more than mere displacement is intended by the term. In Commentary on Case I, (vide page 15) an explanation has been given of the displacement of the pericardium and its contents towards the right. There yet remains to be discussed the rotation of the viscus on its antero-posterior axis. Reference to the anatomical facts related will show that the heart has but one fixed attachment, namely, the root of the great vessels. The viscus being fixed at its base and free at its apex, change in position can only take place in certain directions. It is evident for instance, that the base of the heart

can move but slightly, and that rotation on its long or vertical axis would cause torsion of the great vessels which, if to any extent, would be incompatible with life. The only movement possible is rotation on an antero-posterior axis, the axis of rotation being situated at the base of the viscus. Consequently when the pericardium becomes drawn towards the right, the apex of the heart, which is that part of the viscus that is alone freely moveable, accompanies it. The base of the heart together with the body of the viscus being more or less fixed, the only movement by which the apex can pass to the right is therefore a rotatory one on its antero-posterior diameter. For the same reason this movement of the bulk of the viscus is a limited one. The exact angle through which the movement has occurred must vary with individual cases, I should, however, estimate the movement as having a range of rather more than one third of a circle.

I submit an Appendix containing a list of cases studied.

APPENDIX.

Case	Age	Sex	Occupation.	Classed or note.	Recorded by	Taken from
I	19	M	.....	Traumatic	Dr Tibbits	L I/76 p 598.
2	..	.	.....	Traumatic	Dr Stokes	Anomalies and Curiosities of Medicine, by Gould and Pyle. page 626.
3	...	.	Tailor	Acquired	Dr Powell	L I/78 p 157.
4	48	M	Tailor	Acquired	A.M. McAlldourie M.D.	J 2/86 p 156.
5	32	.	.....	.....	.....do.....	.....do.....
6	41	M	Brick- layer.	.....	C. Pope. F.R.C.S.	L 2/82 p 9.
7	lad	M	.....	Phthisis	.....Swan.	L 2/90 p 55.
8	20	F	.....	Congenital Pulmonary Stenosis.	Dr A. Gross.	J I/88 p 657.
9	15	M	.....	Pulmonary Stenosis	Prof Grunmach	J I/90 p 1441.
10	85	F	.....	Dead in bed	Parker Young M.R.C.S.	J I/61 p 630
11	8	M	.....	.....	Dr Lees	L 11/76 p 894
12	48	M	Railway workman	Killed by accident	Dr Moxon	L 11/76 p 748.
13	aged	F	....	Operation for Ovariectomy.	Mr Treves F.R.C.S.	L I/90 p 664
14	baby	F	One of...	One of twins	Dr Haddon.	L 11/90 p 1156
15	.	M	.....	Aortic killed	Norman Davies	E I/79 p 789.
16	10	F	.....	Acquired	Dr D. Dumont	J 11/80 p 71

APPENDIX.

Case	Age	Sex	Occupation.	Classed	Reported by	Taken from
17.	10	F	.....	.....	J. Mickle M.D.	J 1/83 p 955
18	..	.	.....	.....	Dr Badcock	J 1/81 p 828
19	26	F	Dress- maker	.....	Dr Gerrard	L 1/96 p 1060
20	15	F	.....	.....	Dr W.McLennon	J 2/96 p 1314
21	..	.	.....	.....	Dr Bramwell	E.M.J.1881.1882 Vol xxvii. 743.
22	48	F	Tailor	.....	Own Case	
23	38	F	House- wife	.....	Own case	