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ORIGINAL MEMOIRS.

LARGE INTRATHORACIC CYSTS OF THE THYROID GLAND CAUSING DYSPNŒA.*

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NUMEROUS cases have been reported during the last sixty years of the development of goitre situated partially or completely within the thorax and causing dyspnœa by pressure on the trachea.

The cases of Bonnet,¹ of Lyons, were reported in an article on "The Goitres that Compress and Deform the Trachea," in 1851.

In 1879 Malard² took for the subject of his thesis "The Clinical Studies of Diving or Retrosternal Goitre."

Wührmann³ in 1896 collected the reports of ninety cases of intrathoracic goitre, and made a thorough study of the whole subject. His cases included cystic goitre, solid goitre, and carcinomata developed in intrathoracic thyroid glands.

The title of the thesis of Cadet, written in 1905, is "Endothoracic Goitre," and the work is devoted to diving goitre and to intrathoracic accessory goitres.

Among these reports are a few cases of large intrathoracic cysts developed in misplaced thyroid glands, and having had an opportunity recently of operating on a patient suffering from a similar lesion, I have thought it sufficiently interesting to report this case, to give abstracts of the reported cases of like

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nature, to call attention to the anatomical characteristics and the very striking clinical picture.

CASE I.—A. M., a native of the United States, twenty-one years old, printer by occupation, was admitted to Saint Luke's Hospital in the service of Dr. Hollis, on September 27, 1910. He was suffering from cough, headache, and difficulty in breathing. He said that for the past four years he had been very susceptible to attacks of bronchitis, the slightest exposure to cold or wet causing an attack. For the past two years he had been short of breath on exertion, such as going upstairs or walking up hill.

About a year and a half ago, while dressing in front of a mirror, he chanced to cough, and to his surprise saw a swelling rise above the right clavicle and then disappear. Each time he coughed the tumor appeared. He was stout and in good health, weighing 170 pounds, and except for the shortness of breath and slight headache from time to time, felt well.

He next noticed that his neck was increasing in size. He changed the size of collar from 14 to 14½, then to 15.

During the following year he had two severe attacks of bronchitis, with dyspnoea, wheezing, a persistent cough, and profuse mucopurulent expectoration. Since the last attack he had had increasing difficulty in breathing, and was blue and breathless after even moderate exertion. He was told by his friends that his voice had become harsher. The swelling in his neck increased. He now found it necessary to wear a 16 collar. The protrusion above the clavicle on coughing was more pronounced. He had consulted a number of physicians, and was told that he had a hernia of the trachea, and that this hernial protrusion filled up from time to time with mucopurulent material from the trachea and bronchi.

The present attack for which he was admitted to the hospital was similar to the others but more severe. The cough, dyspnoea, mucopurulent expectoration, and the wheezing were all present.

At no time had he had difficulty in swallowing, nor had he coughed up blood. There had been no soreness or pain connected with the swelling in his neck.

He had had the usual diseases of childhood and had had adenoids removed from his nasopharynx two years ago. Otherwise he had always been in good health.

On examination of his neck, a slight swelling was seen extending from the middle of the right clavicle across the middle line, filling up the episternal notch. On coughing, it grew suddenly much larger and then as suddenly receded again behind the clavicle. The top of the swelling was dome shaped and gave the impression that it extended behind the clavicle and sternum. It did not pulsate.

The swelling seemed to move with the movements of the trachea to some extent, moving up and down slightly on swallowing. The veins on the right side of the neck were engorged, the external jugular stood out as large as the little finger; the veins of the right side of the chest were also engorged. The throat appeared normal. The right pupil was slightly smaller than the left. There were numerous râles to be heard over both lungs, and the respiratory murmurs were harsher than normal. The heart was normal, the pulse regular and of good force, about 140, the respirations 30 to the minute, noisy and wheezing in character. There was moderate cyanosis. The temperature was 103.8°. The leucocyte count showed 16,900 white blood-cells, of which 78 per cent. were polymorphonuclears. The sputum showed the prevailing organisms to be a diplococcus resembling the pneumococcus.

During the next ten days the patient grew gradually worse, the dyspnoea became so severe that he was unable to lie down, the cyanosis and engorgement of the veins were more pronounced; his evening temperature varied between 104° and 105°; the cough and expectoration were very troublesome; he seemed to be losing flesh and strength rapidly, and was in a pitiable condition.

He was then transferred to the surgical division. The following night he seemed a little less uncomfortable but soon all his old symptoms reappeared. From the position of the swelling in its relation to the trachea, it seemed probable that he was suffering from an intrathoracic goitre, which was compressing the trachea and causing the dyspnoea, and it was obvious that unless he were speedily relieved he had not long to live.

Accordingly, under chloroform anaesthesia, a transverse incision about one inch above the clavicle was made across the neck, dividing the skin and platysma. The sternohyoid and sternothyroid were severed, and the sternomastoid strongly retracted. The dissection was carried upward and the superior

thyroid vessels ligated. The bleeding was very profuse from the engorged veins. Blunt dissection soon exposed the bluish wall of a cyst, covered by a thin mantle of thyroid tissue. The patient at this time was taking his anæsthetic badly, and the cyanosis was alarming. The cyst was punctured, allowing about half a pint of thin watery fluid to escape. The dyspnœa was immediately relieved. A Kocher clamp was then placed on the opening in the cyst wall and an attempt made to continue the enucleation. It soon became apparent that this was impossible, as the cyst extended far down behind the sternum and sternal end of the clavicle into the thorax. The upper free portion of the cyst wall was therefore removed, allowing again about half a pint of watery fluid to escape, and a soft drainage tube and a wick of gauze were inserted into the intrathoracic portion. The muscle and skin were then sutured, except for a small aperture for the passage of the tube. The cyst wall was extremely thin.

The duration of the operation was thirty minutes. The patient returned to the ward in good condition, the cyanosis had disappeared, and the respiration was no longer labored.

For several days the bronchitis continued. The temperature on the evening of the fourth day was 104° ; on the seventh day, however, it was 99.8° in the evening and from that time on he continued to improve. He weighed at this time 115 pounds, having lost during his illness 52 pounds.

During this week the dressing was saturated with thin serous discharge. The drainage tube was removed on the fifteenth day, the discharge having become much less, and he left the hospital on the twenty-second day with a small discharging sinus in the neck. He had gained in the three weeks 13 pounds, the temperature was normal, the pulse 108, respirations 24. During the next two weeks he was seen twice a week, and the sinus cauterized with 95 per cent. carbolic acid from time to time, a long probe being used as an applicator. It passed behind the sternum for several inches. At the end of this time the sinus closed, and he returned to his work. He now weighs 150 pounds, and is in good health.

CASE II (Reported by ANTHONY BOWLBY*).—A woman, thirty-four years old, was admitted to St. Bartholomew's Hospital, suffering from difficulty in breathing. She said that two years previously she first noticed a soft swelling in the episternal notch in the middle line of the neck, and that it had increased steadily and spread a little to each side.

Ever since the swelling began she had suffered from shortness of breath, and during the last six months had had occasional attacks of transient but severe dyspnoea. On admission she was suffering from such an attack, temperature was 103° , respirations 50, pulse 150.

Examination of the neck showed at first very little swelling. Such swelling as there was occupied the episternal notch and caused a prominence in this region instead of a depression, and extended laterally under each sternomastoid. When the patient coughed, however, the swelling increased in the most extraordinary manner, and a large rounded mass was suddenly extruded from the chest into the neck and then as suddenly disappeared. The way in which the tumor was projected reminded one much of the sudden protrusion of a large inguinal hernia during coughing. To the touch the swelling was smooth, rounded, and curiously soft. The tumor seemed to move very little on deglutition. An examination of the chest revealed a large area of dullness behind the sternum and cartilages of the first, second, and third ribs, and continuous with normal cardiac dullness. There were loud mucous râles in the trachea and bronchi.

At the operation a large cyst was exposed in the left lateral lobe of the thyroid. The cyst wall was exceedingly thin and extended behind the sternum beyond view. The cyst wall was incised; it contained about a pint of clear, almost watery fluid. "It had displaced the apices of the lungs laterally and extended down to the base of the heart. Its thin walls were reflected over the large vessels, so that on looking into the cavity one saw innominate, carotid, and subclavian arteries. The arch of the aorta was similarly prominent, part of the cyst passing in front of it and part behind, the floor of the cyst rested on the base of the heart, the pulsation of which could be easily seen." The walls were stitched to the skin around the episternal notch.

The patient made an almost uninterrupted recovery. The bronchitis persisted for a few days. The opening in the cyst closed in three weeks. There was no sign of refilling of the cyst. The case was reported in April, 1895. The case entered the hospital in December, 1892.

CASE III (Reported by BOUTARESCO*).—A woman, forty-six years old, married, was admitted to the hospital for an enormous tumor of the neck. She complained of oppression, tired easily, the breathing was short and insufficient. Her voice was hoarse, weak, and hardly understandable. She had pain in the right arm but no motor symptoms. The patient's condition was one of great weakness.

She presented two voluminous tumors of the neck. One occupied the anterior region, and extended from the hyoid bone to the sternum, behind which it disappeared, and between the two sternomastoid muscles. The second occupied the right supraclavicular hollow. The trachea and larynx were pushed strongly to the left. These tumors fluctuated. On puncture a brownish fluid was withdrawn.

In the first operation the lateral tumor in the supraclavicular fossa was removed; one portion of it was adherent to the pleura. At the end of the operation Boutaresco was not a little surprised to discover that there was not only no communication between the two tumors but that

they were separated by the carotid sheath. Seven months later the patient's condition continuing the same, Boutaresco proceeded to extirpate the median tumor. After exposure of the cyst wall, 300-400 c.c. was taken away with a Dieulafoy syringe. It soon became evident, as the dissection proceeded, that the tumor, instead of stopping at the episternal notch, extended far into the mediastinum behind the sternum, making it impossible to complete the enucleation of the cyst. The remaining portion of the contents of the cyst were withdrawn, the cyst wall widely opened, and the hand introduced to determine its relation. Much to his surprise the hand passed behind the aorta and heart, whose pulsation could easily be felt. Anteriorly the cyst wall followed the posterior surface of the sternum to the fourth costosternal articulation. The portion of the cyst in the neck was excised. The intrathoracic portion was drained after suturing it anteriorly to the margin of the wound. The patient made a good recovery. In two months the sinus had closed.

CASE IV (Reported by DEMME*).—A man, sixty years old, was admitted to the medical service of Würzburger Hospital suffering from difficulty in breathing. For some years he had been suffering from shortness of breath, transitory attacks of asthma, and violent fits of coughing.

His neck was short and thick. There was a moderate-sized goitre springing from the isthmus of the thyroid and passing beneath the sternum, under which it seemed to be drawn. This goitre decreased in size under treatment with potassium iodide, but the difficulty in breathing increased and he died in a few days.

At autopsy no goitre was visible above the sternum. The veins of the neck were moderately filled and dilated. The trachea and larynx were not displaced; the goitre of the isthmus, felt on admission to the hospital, had contracted down to a mass about the size of a hazel-nut, surrounded by connective tissue and situated on the trachea.

On removal of the sternum a large cystic goitre appeared. It extended on the left side from the third or fourth tracheal ring to the bifurcation. It was flask shaped. The neck-like narrowing, about 2.5 cm. in diameter, extended into the opening of the thorax. It was covered by the hypertrophied sternohyoid and sternothyroid muscles. The large vessels and nerves of the neck were not displaced. Immediately beneath the sternoclavicular joint and the sternal notch the cyst widened and soon reached a diameter of 7.5-8 cm. The anterior wall lay in immediate contact with the ribs and sternum, without being adherent. Its length was 12.5 to 13 cm. The base of the sac rested on the great vessels, but the arch of the aorta was not compressed. The innominate and subclavian veins, on the contrary, were narrowed and empty centrally, dilated and overfilled peripherally. The left upper lobe of the lung was compressed. The trachea was distinctly compressed from the fourth to the fifth cartilaginous ring to the bifurcation, in the upper part more laterally, from the sternal notch, however, from before backward; the narrowest point was at the first rib. The left bronchus was pale and displaced but not compressed.

The cyst wall was 4-5 mm. thick, and fibrous. The contents consisted of a purulent-like material composed of broken-down blood and colloid.

The tracheal and bronchial mucosa was loosened, reddened, and covered with mucus. These alterations were most marked below the narrowed portion.

CASE V (Reported by PROUST').—The patient was thirty-five years old. He complained of shortness of breath and the presence of a tumor in the neck.

The tumor lay beneath the sternomastoid and was of oval form. It extended from two fingers' breadth below the jaw to the clavicle, beneath which it seemed to pass. The superficial veins were enormously dilated. The tumor was movable laterally. It showed no pulsation, but was thrown up and down by coughing. It did not move on swallowing. Pressure over the tumor caused the patient to cough. It distinctly fluctuated. There was no difficulty in swallowing. The left carotid pulse could not be felt. When pressure was made gradually on the tumor it disappeared almost entirely. When the pressure was removed it slowly returned. The radial pulse was small and irregular. The patient gradually lost flesh and strength, and in about one month died.

At autopsy a spherical tumor was found. It extended beneath the left sternoclavicular articulation into the thorax to the second intercostal space, showing that the disappearance of the tumor on pressure had been due to its being pushed farther down into the thorax. It was about as large as the fist, and was formed from the left lobe of the thyroid and directly attached to the trachea. The trachea was considerably displaced but not narrowed.

CASE VI (Reported by DITTRICH').—The clinical characteristics of this case had been reported by Singer two years previously. He suggested at that time as the most probable diagnosis a fibroma, which had its origin in the lung or pleura.

The patient had been under observation during the interval and had been admitted to the hospital at Prague for violent coughing attacks and hæmoptysis. At no time had there been any manifestation which would have suggested a connection between the tumor and the thyroid, such as a protrusion in the supraclavicular region, or a palpable connection between the tumor and the thyroid region.

The patient was a woman of sixty years, suffering from difficulty in breathing. There was a dulness on percussion over the upper part of the right side of the thorax. There was also enormous dilatation of the superficial veins in the region of the upper aperture of the thorax. There was absence of the pulse in the right carotid, and moderate widening of the right pupil. During her entire illness she had had attacks of bleeding from the lungs, and she died from such an attack.

At autopsy, on opening the chest, a tumor the size of a man's head presented, which occupied nearly the entire half of the thorax. It was a long oval mass, having an upper and a lower pole. Its surface was smooth. At only one point on the level of the first rib on the forward and outer part was there any attachment to the thoracic wall. The pleura

invested the tumor, being inverted by it, and was readily separated from it. Over the forward and upper pole ran the innominate artery and the right subclavian vein.

At the upper pole of the tumor was a reddish-brown mass which extended to the height of the third tracheal cartilage. This mass was gradually lost on the surface of the tumor as it passed downward, making a mantle-like covering. Above the third tracheal cartilage there was no thyroid tissue. On the left side was a well-developed lobe of the thyroid, reaching as high as the middle of the left side of the thyroid cartilage. Section of cyst showed that walls were about 5 mm. thick. It contained about three litres of a moderately thick, yellowish-brown fluid. Microscopic section showed the mass at the upper pole of the tumor to be made up of thyroid tissue. The isthmus of the thyroid had entirely disappeared.

The right lung lay compressed along the medial side of the lower part of the cyst.

The trachea was pushed to a moderate extent to the left along its entire length, and the right main bronchus seemed also pushed to the left and flattened. The mucosa of the latter was ulcerated throughout its entire extent. Examination for tubercle bacilli in the neighborhood of the ulceration gave negative result.

CASE VII (Reported by WÖLFLE*).—The patient was a man of twenty-six years. On the left side was a cystic goitre. On opening the cyst the finger passed into a large cavity which extended from the cricoid to far down beneath the sternum.

Anatomical Considerations.—The isthmus of the thyroid usually lies in contact with the three or four upper rings of the trachea. The entire thyroid may, however, be situated much lower, the isthmus reaching the sixth tracheal ring, and Nuhn¹⁰ observed a thyroid, otherwise normal, where the narrow isthmus lay behind the sternum, the left lobe was almost entirely behind the sternal portion of the sternocleidomastoid muscle; the right, more deeply placed, reached the upper border of the arch of the aorta, and its blunt end completely filled the angle between the innominate and left carotid artery.

In certain instances the neck is short, the larynx low, and the isthmus and lateral lobes are situated partly within the thorax. Kocher¹¹ calls this condition thyreoptosis.

An accessory thyroid gland may exist below the thyroid, within the thorax.

In any of these anatomical conditions a goitre developing within the gland may be situated partially or wholly within the chest. But in many instances the development of a retro-

sternal goitre seems to be due less to the deep position of the thyroid than to the circumstance that adenomatous material begins to grow from the lower border toward the retrosternal or retroclavicular space. The prolongation preserves a broad connection with the portion of gland from which it is derived, or the pedicle gradually stretches until it is reduced to some vessels and a layer of connective tissue, more or less thick, the vestige of the capsule. This extension is aided according to Kocher¹² by two circumstances: first, the gland has a tendency to be sucked into the thorax during inspiration; second, the gland is forced into the thorax when the head is inclined forward.

Wührmann³ found that the development of intrathoracic goitre from an accessory thyroid gland was exceptional. It occurred five times in his series of ninety cases.

A normal thyroid or a small goitre situated at the upper opening of the thorax can move up and down, lying now above and again below the aperture. As a goitre increases in size this excursion becomes less easy, and it may be caught below the opening and no longer be able to emerge in the neck, or certain manipulation, such as extending the neck or pulling on the pedicle, may be necessary to release it. The cases reported by Malard and by Bonnet are of this character. In most instances the goitre did not exceed in size a hen's egg. The incarceration of such small goitres may be followed by fatal results from pressure on the trachea, and the French writers of thirty or forty years ago drew attention to the disproportion between the size of goitre and the seriousness of the symptoms. Goitres which are freely movable, being at times intrathoracic and at times above the sternum, are called diving goitres (*goitre plongeant*).

On the other hand the goitre may pass within the thorax and continue to grow, causing for a long time few pressure symptoms, and being visible above the thoracic opening only during forced respiration, deglutition, and above all during coughing, or there is no evidence of a swelling above the clavicle or sternum. In this class belong the cases I have reported.

Symptoms.—The patient is as a rule an adult, and his chief

complaint is dyspnoea, at first noticed only after exertion, such as walking rapidly or going upstairs. It is progressive. He is very susceptible to attacks of bronchitis, and during these attacks the dyspnoea becomes much worse. The expectoration may be very profuse. There are wheezing and a very troublesome and persistent cough. The dyspnoea may be so severe that the patient is unable to lie down, sitting up all night in an arm chair like an asthmatic. There is little or no difficulty in swallowing. The voice is often harsh. The pupil on one side may be dilated. The patient gradually loses flesh and strength. The process in these large cysts is very slow, years not months intervening between the first symptoms and attacks demanding immediate relief.

There may be dulness on percussion over the upper part of the chest, extending at times to the third or even fourth space. The veins of the neck and chest are engorged. The carotid pulse may be absent. There may be abnormal sensations in the arm. On careful palpation of the trachea it is found to deviate from the middle line. In most instances a rounded mass can be felt above the sternum. It is smooth, compressible, and fluctuates. Coughing causes it to become suddenly prominent, suggesting the appearance, as mentioned by Bowlby,⁴ of an inguinal hernia when it is protruded by coughing. The mass may pulsate, but the pulsation is not expansile, and usually there is no murmur heard. By direct examination with the tracheoscope,^{13 14} one should be able to see the narrowing of the trachea, and the examination by the X-ray might be of great value.¹⁵

Diagnosis.—The symptoms recounted—cough and dyspnoea from pressure on the trachea or bronchi, paralysis of the recurrent laryngeal, widening of the pupil from pressure on the ocular pupillary fibres of the sympathetic, dilatation of the veins of the neck, weakness or absence of the carotid or radial pulse, and dulness over the upper part of the chest—obviously might be caused by any mediastinal growth, whether it be hypertrophy of the thymus, enlargement of the tracheobronchial lymph-glands, aneurism of the aorta, or new growths or cysts arising in one of the mediastinal structures.

If, however, these pressure symptoms are present, and at the same time a tumor can be palpated in the neck just above the sternal notch or clavicle, and if above all it increases suddenly on coughing or moves with swallowing, then the diagnosis of an intrathoracic goitre should be made. If the symptoms have developed very slowly and if the tumor is soft and fluctuating, then a cyst of such an intrathoracic goitre should be present.

In the case reported by Dittrich no tumor appeared in the neck, and during life the diagnosis was not made.

Hypertrophy of the thymus occurs during the earlier years of life. In enlargement of the tracheobronchial lymph-glands there are usually other glands to be felt in the neck. Aneurisms of the aorta give usually expansive pulsation; a thrill, and a double murmur. They may push out the wall of the chest and be seen and felt to pulsate. In absence of physical signs the shadow cast by the X-ray may be of service.

Malignant growths, whether they spring from the lymph-glands, mediastinal tissue, or thyroid gland abnormally placed, all cause by their rapid growth a correspondingly rapid evolution of the symptoms related, in marked contrast to the slow unfolding of the symptoms of a cyst. With *echinococcus* cysts and dermoid cysts, in the absence of a palpable tumor, the differentiation would be impossible. Dermoids which have ruptured into a bronchus have been diagnosed by the coughing up of hair, and attacks of urticaria might make one think of an *echinococcus* cyst.¹⁶

The sudden appearance of a swelling in the neck after coughing, the softness of the tumor, and the attacks of dyspnoea might lead to the diagnosis of an *aërocele*, that is hernia of the mucosa of the trachea. But *aërocele* should give the physical signs of a tumor filled with air, not watery fluid, nor should there be present the signs of a mediastinal tumor causing pressure.¹⁷

Treatment.—No attempt has been made in any of these large cysts to remove the cyst wall of the intrathoracic portion. Such an attempt would be hazardous.

Yet in the case reported by Dittrich, although the cyst was

so extensive, at autopsy it was found adherent only to the chest wall at one point.

The cyst has usually been opened, the cyst wall sutured to the margin of the skin wound and drained. The cysts have not refilled after this simple treatment, the sinuses closing within two or three months.

In 1901 Kocher¹¹ reported twenty-two cases of intrathoracic goitre in which the goitre had been enucleated. He had had no fatalities. They were enucleated or, where this was impossible, removed piecemeal by the finger working inside the capsule of the gland, thus opening cysts or even abscesses. He does not speak of large single intrathoracic cysts.

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