Cholesterol Pleural Effusion

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Cholesterol pleural effusion is a rather rare condition. It has been called by several names—cholesterol pleurisy, cholesterol-thorax, cholesterous effusion, and cholesterol pleural effusion; the latter name appears to be the best. It is a pleural effusion with cholesterol crystals in the fluid. Only 44 cases were reported in the literature up to 1929. Since then there have been 15 cases reported. The first detailed description of a case was given by T. Churton1 in 1882. The most recent description was by Curran2 in 1948.

The etiology remains rather obscure, but there are many theories concerning its occurrence. The fact remains that although the process of chronic pleural effusions is common, deposits of cholesterol crystals in pleural effusions are rarely encountered.

The following is the case reported:

Chief Complaint: H.W.A., a bookbindery foreman, white, 52 years of age, was admitted on April 7, 1946 with the chief complaint of shortness of breath. Three weeks before admission after walking quite strenuously, there was temperature elevation, rapid pulse and the onset of dyspnea.

A local physician was seen who prescribed treatment for a condition known as Virus "X". After three weeks he was somewhat improved and returned to work, however, he remained short of breath. Because of the persistence of symptoms, he was admitted to the hospital.

Past History: Revealed malaria and incipient tuberculosis with sanatorium treatment in 1923. No pneumothorax therapy was instituted. There has been no recurrence of active tuberculosis. In 1938, the patient had bronchiectasis and prostatitis for which he was treated with recovery. In 1940, there was an attack of pneumonia without complications. There were no operations, and no loss of weight or constitutional symptoms.

Family History: One daughter had tuberculosis which is now arrested. Mother and father both died of cancer. No nervous or mental diseases.

Physical Examination: Revealed an obese white male who was acutely ill. Temperature was 102 degrees F, pulse 120, respiration 45, and blood pressure 175/110. There was dyspnea with mild cyanosis of the lips and nailbeds. The trachea was deviated to the left. There was flatness over the whole right chest with some bronchial breath sounds at the right

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The opinions expressed are those of the author and do not reflect those of the Navy Department or the Naval Service at large.
### TABLE 1

**BLOOD DETERMINATIONS**

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<tr>
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<th>1949-4-8</th>
<th>4-10</th>
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<td>Total Protein gms./100 cc.</td>
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<td>Urea Nitrogen mgms./100 cc.</td>
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<td>Sedimentation Rate mm./hour</td>
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**PLEURAL FLUID**

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<td>Cholesterol Crystals</td>
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<td>Amount Aspirated cc.</td>
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<td>2200</td>
<td>1250</td>
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<td>275</td>
<td>650</td>
<td>250</td>
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apex. The heart was normal except for rapid rate and accentuated second aortic sound. The prostate was boggy and enlarged. The remainder of the physical examination was normal. The blood count was normal. The erythrocytic sedimentation rate was 25 mm./hour. Urinalysis revealed only a two plus albuminuria with numerous leucocytes on the microscopic examination. The blood urea nitrogen was 12.8 mgms., the serum cholesterol was 280 mgms., and blood sugar was 108 mgms. per 100 cc. The total proteins were 7.43 gms. The serum albumin was 4.49 gms. and the serum globulin was 2.94 gms. per 100 cc. The blood Kahn was negative. A thick blood smear did not reveal malarial parasites.

Special Studies and Treatment: Thoracentesis was done on April 8, 1949, and 500 cc. of a yellowish turbid fluid was removed. The specific gravity was 1.030. Bacterial and mycobacterium tuberculosis cultures and smears were all negative. The pleural fluid revealed many cholesterol crystals and these only.

Bronchoscopy done on this day revealed only distortion of the right bronchial tree and displacement of the trachea to the left.

On April 10, 1948, a second thoracentesis was done and 2200 cc. of opalescent yellow fluid was removed. This fluid had a peculiar astringent odor. The specific gravity was 1.025. The smears and cultures were again negative, and the smear revealed again only cholesterol crystals. The pleural fluid contained a content of 721 mgms. per cent of cholesterol and 400 mgms. per cent of cholesterol esters, a total protein of 3.84 gms. per cent, an albumin content of 3.02 gms. per cent and 2.62 gms. per cent of globulin. Repeated thoracenteses were performed thereafter on April 12, 1948, when 1250 cc. of opalescent yellow fluid was removed. (On this occasion 10 cc. of methylene blue was instilled and was not recovered either in the sputum or on bronchoscopic aspirations). On April 14, 1948, 650 cc. of the same type of pleural fluid was removed. On April 15, 1948, 275 cc., one day later 650 cc., and three days later 250 cc. of yellow, orange fluid were aspirated.

During these repeated aspirations the patient regained normal breathing, and was ambulatory. On April 22, 1948, 175 cc. of yellow, orange fluid was removed. On April 27, 1948, the fluid (260 cc.) was straw colored and clear.

The next taps were done in May, the first, when 225 cc., and the third, when 125 cc. of amber colored fluid were removed.

Another bronchoscopy was done on May 3, 1948, when only less distortion of the right bronchial tree was noted.

On May 6, 1948, fluoroscopic examination revealed only a small amount of fluid covering the diaphragm which remained so until the patient's discharge on May 17, 1948.

The fluid revealed cholesterol crystals throughout the hospital stay. The laboratory examination of the fluid on May 3, 1948, showed total cholesterol 150 mgms. per cent and a total protein content of 4.05 mgms. per cent, with albumin of 2.50 gms. per cent and globulin of 1.55 gms. per cent. There were only cholesterol crystals present. The sedimentation rate on May 12, 1948, was 12 mm./hour. The patient was discharged on May 14, 1948, and since that time has enjoyed good health. He was last examined on March 12, 1949, and was found to have returned to his occupation since discharge and without any symptom or trouble. The various data have been tabulated in Table 1.
Discussion

The rarity of cholesterol pleural effusion is of great interest, especially since chronic pleural effusions are so common. Erwin reported that he could only find 30 cases up to 1941, but 44 cases can be found up to 1929, and since 1929, there have been 15 more cases reported in the medical literature. Auerbach in a large series of approximately 400 autopsy cases of tuberculous empyema and nontuberculous effusion or empyema at Seaview Hospital, Staten Island, New York, could not find a single case in his experience. Durham and Diamond reported the first case in 26,000 admissions of pulmonary disease cases admitted to the Veteran's Administration Hospital, Oteen, North Carolina. Evander and Curran have reported the last cases in the literature.

The reasons that cholesterol crystals form in these fluids have been advanced by several authors. It is always associated, as with this case, with marked pleural thickening. Often, too, the pleural effusion is encysted. However, the gross pressure symptoms noted in the case reported above is a rather uncommon occurrence.

In all cases the characteristic finding is the polyhedral crystals in the pleural fluid. The cholesterol content decreases with the repeated aspirations (as noted in this case).

An attempt has been made to explain the presence of cholesterol crystals on the albumin-globulin ratio in which the albumin-globulin ratio equal to, or greater than 1.0 is considered to be choles terolytic and the cholesterol is thereby kept in solution, whereas, the albumin-globulin ratio less than one, tends to allow precipitation of the cholesterol. Review of the other cases in the literature do not appear to bear out this concept. The case reported in this article does not appear to bear out this view either. It appears that with in vitro experiments this influence of the albumin-globulin ratio is true, but it is untrue clinically.

Most of the ideas for the formation of the cholesterol crystals attribute it to local causes, in the main the alterations of the thickened pleura. There are two workers who believe that actual lipoidal degeneration of the pleura occurs which forms cholesterol crystals. Coyon believed that most of the cholesterol came from the destruction of the leucocytes in the pleural fluid. Others believe that destruction of tubercle bacilli or degeneration of caseous foci on the pleura or subpleural zone results in the formation or spilling out of cholesterol. Barbieri holds that the cholesterol originates from the blood and due to pleural alterations cannot be reabsorbed. The views that it is a general metabolic disturbance do not have any evidence to support them. The local factors associated with the long standing
disease with the marked thickened pleura appear to cause the cholesterol to accumulate due to precipitation of the cholesterol already present. The greatly reduced permeability of the pleura was experimentally shown by Rouillard.22

Although cholesterol pleural effusion usually occurs in middle aged individuals, Sharpe23 reported a case in a 9 year old child. The question posed by Mainini19 that the deposition of cholesterol occurs only in the pleural cavity is incorrect, for it has been reported as occurring in the pericardium24,25 and peritoneal cavity.26

That the condition is closely associated with tuberculosis appears quite evident from the literature and in the case reported in this article; this is true when even the tubercle bacilli are not recovered27-29 The highest cholesterol content of pleural fluid reported was 45 grams per litre by Hedestrom.30

The treatment of this condition reveals itself into occasional aspirations of the pleural cavity to relieve pressure symptoms, the aspirations should lie between frequent ones and rare ones, and each case will have to be handled individually. One would recommend aspirations every three or four months, which might obviate the development of a bronchopleural fistula. Coyon17 reported such a complication in one case. This plan of therapy appears to be satisfactory, and in our case the need for further aspirations has not occurred in over one year. It is possible that if the disease is not controlled and is troublesome either due to pressure symptoms or dyspnea or a broncho-pleural fistula, decortication or resection of the lung or both combined may be performed. It is interesting that Chaufford11 recommended a pleurotomy if repeated aspirations were not of value.

SUMMARY

1) A case of cholesterol pleural effusion is presented.
2) The nature, etiology and treatment of the condition are discussed.

RESUMEN

1) Se presenta un caso de derrame pleural colestéarico.
2) Se discute la naturaleza, etiología y tratamiento de este estado.

REFERENCES

4 Averbach, O.: Personal communication.
18 Kauffczky as quoted by Castex et al.