

PYOPERICARDIUM: A REPORT OF TWO CASES

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Pyopericardium, or purulent pericardial effusion, it is generally agreed, is a condition which does not respond satisfactorily to conservative medical treatment. Medical treatment essentially consists of:—

1. Diagnostic aspiration.
2. Exhibition of the appropriate antibiotics.
3. Repeated aspirations to relieve tamponade.
4. Supportive treatment.

The recognised sites for aspiration are:—

- (a) Just external to the apex beat.
- (b) Through the 4th left intercostal space, 1" lateral to the left sternal border.
- (c) Through the xipho-costal angle.
- (d) Through the back—this is very seldom employed.

It has been the general experience that after a few aspirations, the pus either becomes too thick to come through even the biggest needle, or it pockets so that it is almost impossible to aspirate completely. Further, the danger of injuring one of the coronary vessels increases with the number of aspirations, and certain sites, especially the posterior surface, are relatively inaccessible to the aspirating needle. If the effusion is allowed to remain inside the pericardial cavity for any length of time, organisation occurs giving rise to a layer of fibrin and fibrous tissue over the visceral pericardium which very considerably hampers the heart action. This, in time, goes on to the condition of chronic constrictive pericarditis, with its characteristic features of a large silent heart, pulsus paradoxus, oedema of legs, ascites, liver enlargement, and pleural effusion. This condition is usually an end-result of tuberculous pericarditis, but is occasionally seen after ordinary pyogenic pericardial effusion. The treatment of choice in such cases is surgical decortication of the heart, which implies usually removal of the parietal pericardium, and clearance of the visceral pericardium, or quite often, the myocardium. This operation is often done at a fairly late stage of the disease, when it becomes quite difficult.

Two cases are described here which were referred for radical surgery at a relatively early stage, so that operation was not so difficult, but results were excellent.

CASE I

L.C.H., a male Chinese carpenter, aged 20

years was admitted on 20th March, 1959 with a complaint of 20 days fever with retrosternal pain. His fever occurred mainly at night and his feet felt chilly. His pain was vague at first, but constant, then became retrosternal in position and moderate in intensity, being aggravated by breathing. It became progressively worse, till he had difficulty in breathing, because of a constricting sensation in the chest. He also had loss of appetite and abdominal discomfort after meals. There was no change in micturition or bowel habits.

On examination, he was afebrile, pale, and had oedema of the legs. There was no clubbing of the fingers or dyspnoea at rest. The ears, nose and throat were clear, the trachea was central, but the neck veins were engorged. The blood pressure was 100/60, the pulse 160 per minute, and was of the typically pulsus paradoxus type. The heart sounds were faint. There was diminished movement of the left lung with decreased expansion, air entry and vocal fremitus and increased percussion note. In the abdomen, the liver was enlarged to 3 fingerbreadths below the costal margin, firm and tender, but the spleen was not palpable.

The provisional diagnosis of pericardial effusion with left pleural effusion was made, and a paracentesis of the pericardium was carried out. This yielded 170 ml. of bloodstained fluid, containing 35 mg% of sugar, and pathogenic *Staph. aureus* was grown, sensitive to all the antibiotics used. Blood culture was negative. His haemoglobin was 105%, total white count 11,300, with polymorphs 71%, lymphocytes 17%, eosinophils 8%, monocytes 4%. The urine was clear.

He was put on Streptomycin and Isoniazid, and a salt-free diet.

PROGRESS

- 21.3.59: Patient feels better, but still has pulsus paradoxus; B.P. 110/60, face still puffy. Another paracentesis yielded 220 ml. of blood stained fluid, which showed, on staining, gram positive diplococci, red blood cells + + +, polymorphs + +, lymphocytes +, but no tubercle bacilli, *Staph. albus* (non-pathogenic) and *Staph. aureus* were grown, sensitive to penicillin, streptomycin and chloramphenicol.
- 22.3.59: Temperature up, pulsus paradoxus still present, air entry left base much

- diminished, cardiac dullness still increased. Put on penicillin.
- 23.3.59: Temperature still up, neck veins less engorged, no oedema, but liver now 4 finger-breadths.
- 24.3.59: Face still puffy, ascites+. Paracentesis yielded 130 ml. of fluid containing 69 mg% of sugar, gram negative bacilli, short and thick in fair numbers, polymorphs ++, lymphocytes few, no tubercle bacilli. It was sterile on culture.
- 25.3.59: Heart sounds still faint, face less puffy.
- 27.3.59: B.P. 100/60. 500 ml. bloodstained fluid aspirated, containing 50 mg% of sugar, no organisms, polymorphs++, lymphocytes+, red blood cells+++.
- 28.3.59: Face less puffy, ascites+, B.P. 90/60.
- 29.3.59: Temperature up again, B.P. 100/50.
- 30.3.59; B.P. 98/50, heart sounds faint. 200 ml. of heavily bloodstained fluid aspirated, containing 70 mg% of sugar, red blood cells + + +, polymorphs + +, lymphocytes + +, also sterile on culture.
- 1.4. 59: B.P. 100/80, face puffier, ESR 19 mm.
- 2.4.59: B.P. 90/60, severe pain left shoulder, orthopnoeic. 300 ml. of heavily bloodstained fluid aspirated without relief of symptoms. This fluid contained 91 mg% of sugar, red blood cells + + +, polymorphs + +, lymphocytes few, no organisms; haemoglobin was 91%. Because of this lack of relief, the patient was referred for surgery.
- 3.4.59: B.P. 100/60.
Pericardiectomy was done under general anaesthesia. The fluid obtained contained no organisms, but red blood cells + + +, polymorphs + +, lymphocytes few, and was sterile.
- 4.4.59: Drainage from chest tube was 110 ml. B.P. 120/60, pulse rate 94 per minute, good volume, regular, no dyspnoea, neck veins not seen, oedema less; haemoglobin 71%.
He was taken off Isoniazid, the intravenous infusion was stopped and he was put on feeds.
- 5.4.59: Temperature still swinging, drainage 110 ml. stale blood, pulse rate 100/minute, apex beat showed occasional extrasystoles. He was put on digitalis.
- 6.4.59: Temperature still swinging, drainage 400 ml., apex beat = pulse rate 90, with occasional extrasystoles. Liver not palpable.
- 7.4.59: Afebrile, apex beat = pulse rate = 80, regular, drainage 40 ml. Chest tube removed, and patient was put on a maintenance dose of digitalis.
- 8.4.59: Afebrile, general condition satisfactory,

pulse rate 76, regular, ambulant.

- 10.4.59: Taken off penicillin and streptomycin.
- 12.4.59: Stitches removed, union by first intention.
- 13.4.59: Discharged from hospital.

SUBSEQUENT FOLLOW-UP

- 18.4.59: No tamponade, well.
- 24.6.59: Well; asked for a fit certificate, which was issued.

Operation: Pericardiectomy (J.E.C.) Date: 3.4.59

Anaesthetic: General (G.T.)

Position: Supine.

Incision: Along line of left 5th rib and costal cartilage from midline to anterior axillary line anteriorly. 5th costal cartilage and anterior end of that rib resected, left pleural cavity opened through rib-bed.

Findings: Bloodstained pleural effusion.

Bloodstained pericardial effusion.

Parietal pericardium about 6 mm. thick and very enlarged.

Visceral pericardium covered by a thick fibrous layer, 3 mm. thick, which completely encircled the heart and obscured the heart beat completely.

Done: Pleural effusion evacuated by suction.

Parietal pericardium incised vertically in front of presumed position of left phrenic nerve from great vessels to diaphragm, then horizontal extension made to the right about 3 cm. above the diaphragm to the right border of the heart.

Pericardial effusion evacuated by suction.

Fibrous layer over visceral pericardium incised and dissected off from both ventricles right round the heart. The cardiac pulsation became evident as soon as the myocardium appeared from under cover of this fibrous layer and continued to improve till the dissection was complete; the radial pulse also strengthened very considerably.

The atria were also freed, especially round the mouths of the great veins.

The parietal pericardium was closed loosely without drainage.

A drainage tube was inserted into the left pleural cavity through a separate stab wound in the anterior axillary line.

The chest was then closed in layers.

Post-operatively, the chest tube was connected to a suction pump. One pint of blood was given, followed by dextrose and saline.

Anaesthesia: The patient was premedicated with 50 mg. Pethidine and 0.45 mg. Hyoscine an hour before operation. Pre-oxygenation was commenced at 10.55 a.m., using a

Waters' circuit without the absorber. After 5 minutes, Nitrous Oxide was introduced at 8 litres per minute and the oxygen flow was reduced to 2 litres per minute. Three minutes later, 50 mg. Suxamethonium was given intravenously and the patient intubated with a No. 10 cuffed Magill's tube. The closed circuit was substituted and anaesthesia maintained with intermittent positive pressure respiration using 4 litres Nitrous Oxide and 2 litres oxygen and a controlled leak. Intermittent doses of Suxamethonium were given, a total of 300 mg. being used. At 12.20 p.m., when the operation was over, oropharyngeal toilet was performed and the patient extubated. He was fully conscious and his post-operative course was smooth.

CASE II

P.A.H., female Chinese, aged 2 years, was admitted with a complaint of 6 days fever, which was irregular and intermittent in character and associated with vomiting of ingested food. The bowels were regular, the micturition was yellowish, small amounts being passed. There was a previous history of post-measles bronchopneumonia and tonsillitis seven months previously, treated with penicillin for three days in hospital. Her diet consisted mainly of milk, and her milestones had been normal.

On examination, the child was dyspnoeic, febrile (101.2°F), slightly drowsy. The face was puffy with an abscess on the right side of the head and multiple septic spots. The pharynx was injected and the tonsils were injected and enlarged. The peripheral pulses were palpable, 136 per minute, the apex beat was in the 4th interspace, heart sounds were normal. Respirations were 32 per minute, and the alae nasi were working; bronchial breath sounds were heard on the left side with fine crepitations. The liver was palpable 1 fingerbreadth below the costal margin.

The child was put on chloramphenicol, Vitamin B₁, expectorant mixture and chloral.

Lumbar puncture gave a sterile C.S.F. and E.C.G. showed elevated ST segment in Leads II and III.

PROGRESS

- 13.6.59: Temperature swinging, apex beat 160, harsh breath sounds and crepitations posteriorly on the right.
 14.6.59: Temperature down.
 15.6.59: Respiration laboured. X-ray showed a large globular heart, probably effusion. Child was put on Mersalyl, Diamox, Sulphadiazine,

Potassium Citrate mixture and Digitalis.

- 16.6.59: Liver 2 fingerbreadths, oedema of legs. Haemoglobin 43%, total white count 12,600.
 17.6.59: Some improvement—less dyspnoeic, oedema decreasing, pulse 140, temperature down.
 18.6.59: Temperature normal, heart—left border at anterior axillary line, right border at sternum, liver 1 fingerbreadth, pulse 120, no oedema.
 20.6.59: Swelling left parotid region, pus expressed from orifice of Stenson's duct. Treated with fomentations.
 Blood culture was sterile. The pus from the parotid contained Staph. aureus, sensitive to Tetracycline, Sigmamycin, Oleandomycin and Neomycin.
 21.6.59: Condition ISQ. Taken off Chloramphenicol and put on Sigmamycin.
 22.6.59: Parotid incised, but no pus found. Child's condition otherwise unchanged, taking feeds well.
 23.6.59: Diagnostic paracentesis of the pericardium produced 2 ml. of pus, containing pathogenic coagulase + Staph. albus, sensitive to all the antibiotics. Haemoglobin 49%.
 24.6.59: Still dyspnoeic, liver 1½ fingerbreadths. Taken off Digitalis. The child was then referred for surgery because it had been found in previous cases that repeated aspirations gave very poor results. Haemoglobin 40%, total white count 5,500.
 25.6.59: Pericardiotomy and drainage of the pericardial cavity were performed under general anaesthesia. The pus obtained contained Staph. aureus, sensitive to Penicillin, Streptomycin, Chloramphenicol, Oxytetracycline, Sigmamycin (+ +), Oleandomycin and Neomycin.
 26.6.59: Temperature normal, haemoglobin 67%.
 27.6.59: Temperature up, but general condition better. Developed Thrush. Haemoglobin 65%. Drainage catheter removed.
 29.6.59: Not dyspnoeic, liver just palpable, parotid swelling down. Apex beat 160, heart sounds clear; haemoglobin 75%, total white count 6,600.
 30.6.59: Lungs — crepitations left side, liver 1½ fingerbreadths. Left chest aspirated to yield 90 ml. thin tea-coloured fluid, sterile on culture.
 2.7.59: Temperature down, apex beat 140, right border of heart normal, left border still out; crepitations left axilla and back, air entry good; liver 1 fingerbreadth. Left chest aspirated — 5 ml. clear fluid.

- 3.7.59: ISQ.
 4.7.59: Pericardial aspiration—nil.
 5.7.59. Temperature settling.
 6.7.59: Temperature normal, not dyspnoeic, heart normal size, mouth clearing; still crepitations left axilla.
 8.7.59: Lungs improving.
 11.7.59: Taken off antibiotics. Haemoglobin 60%, total white count 9,600.
 12.7.59: Lungs—occasional rhonchi only left side.
 23.7.59: Discharged from hospital.

SUBSEQUENT FOLLOW-UP

31.7.59: Seen as outpatient—no complaints, heart N.A.D.

Operation: Pericardiotomy and drainage (J.E.C.). **Date:** 25.6.59

Anaesthetic: General (G.T.).

Position: Supine.

Incision: Over praecordium in 4th left inter-space; pleura not opened.

Findings: Thick yellow pus ++ in pericardial cavity.

Done: Parietal pericardium opened by transverse incision, 3.5 cm. Pus evacuated completely by suction. Visceral pericardium then clearly seen, covered by very thin translucent membrane. Heart action markedly improved after evacuation of pus.

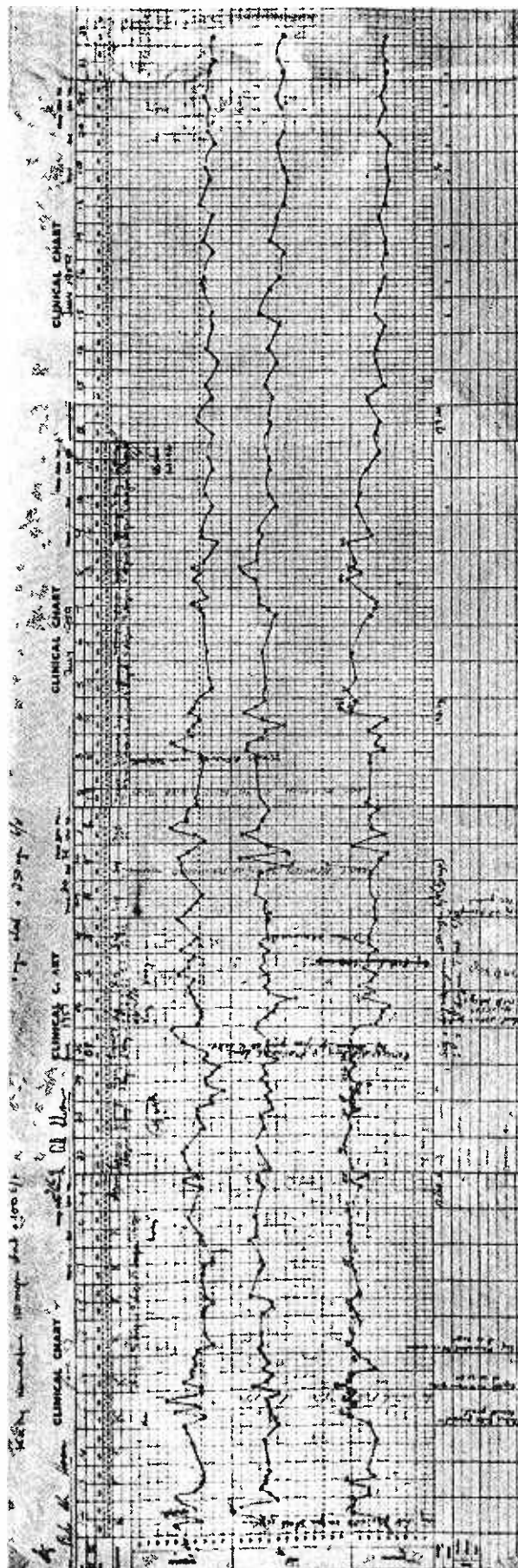
Rubber catheter inserted into pericardial cavity.

Parietal pericardium closed with 2 interrupted linen stitches round catheter.

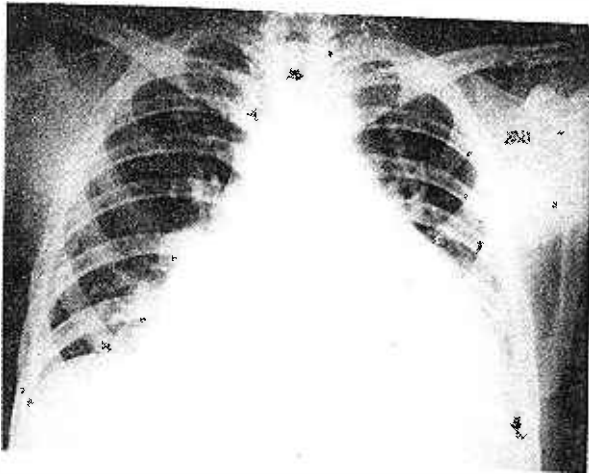
Chest wound closed in layers round catheter.

Post-operatively, the catheter was allowed to drain into a bottle under water. Four hours after operation, it was withdrawn from the pericardial cavity, but left to drain the intercostal space.

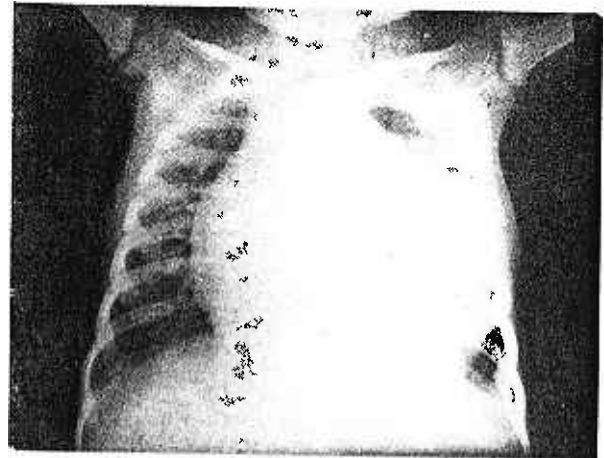
Anaesthesia: The child was premedicated with only 0.45 mg. Atropine, given half an hour before operation. She was pre-oxygenated for 5 minutes, using a T-piece circuit (Rees, 1958), and after introducing Nitrous Oxide at 6 litres per minute and reducing the Oxygen to 2 litres per minute, she was given 15 mg. of Suxamethonium. After inflation with Nitrous Oxide and Oxygen, she was intubated with a No. 1 Magill's tube and the oropharynx packed.



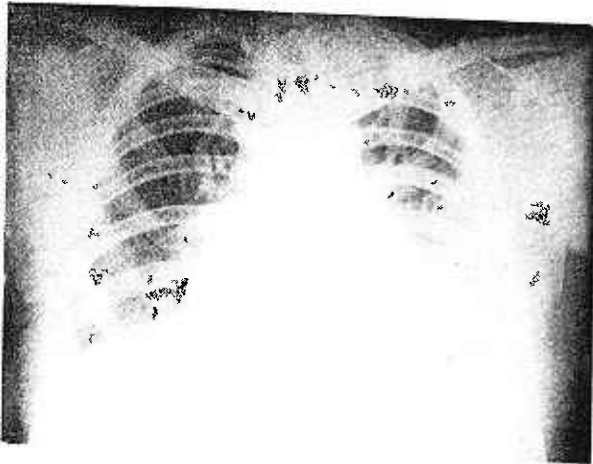
Case II. Temperature Chart.



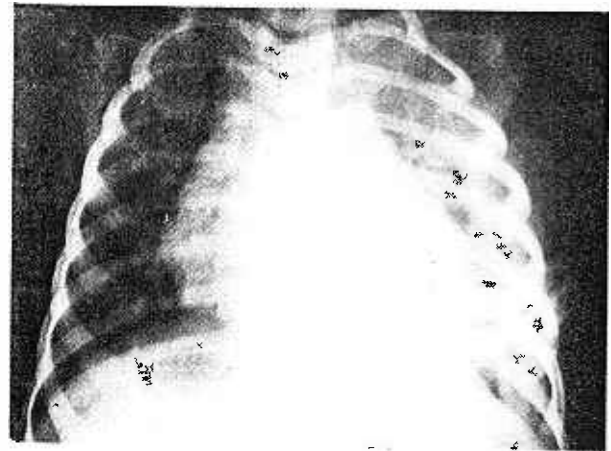
Case I. Pre-operative



Case II. Pre-operative



Case I. Post-operative



Case II. Post-operative

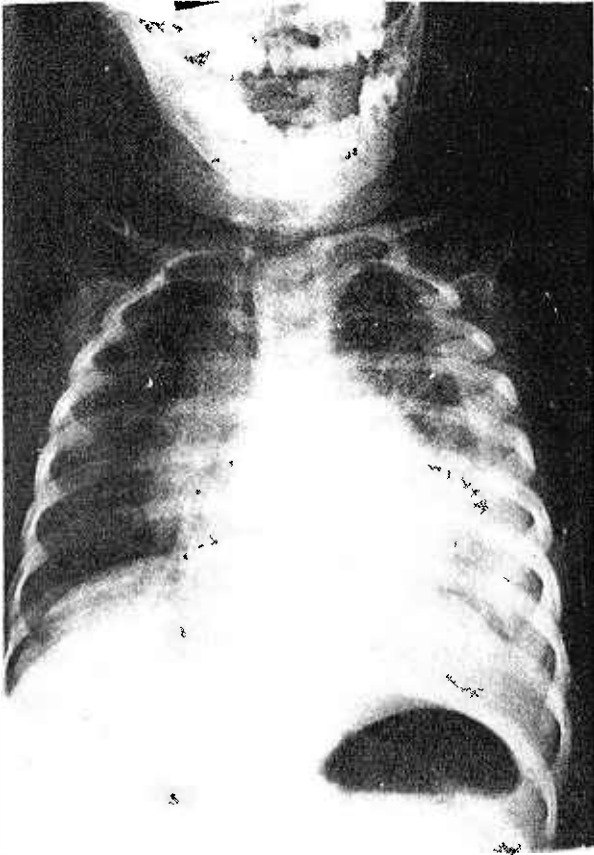
As soon as the operation commenced, at 12.55 p.m., she was given a further 15 mg. of Suxamethonium, and intermittent positive pressure respiration instituted with 4 litres Nitrous Oxide and 2 litres Oxygen, till the operation was over at 1.15 p.m. The child's oropharynx was sucked out and she was extubated. She was fully conscious and made a good recovery.

DISCUSSION

The mortality rate for purulent pericardial effusion is extremely high. Among children in the Paediatric Unit, there have been practically no survivors. These two cases have been described to show that early surgical intervention may be the answer to this problem. The first case was only getting temporary relief from repeated aspirations, and surgical drainage was adopted as a desperate measure. The result was so dramatic, that the second case was accepted after only one diagnostic aspiration. Previous

attempts to treat other such children by drainage through stab incisions had proved unsuccessful, so a bolder approach was decided on.

The basic problem in both cases was one of anaesthesia. Though the first case might possibly have been done under local anaesthesia, the operation would then have had to be much more limited in scope for fear of transgressing the pleural cavity. General anaesthesia allowed the more radical operation to be carried out. The second case was too young for anything other than general anaesthesia. Once the anaesthetic problem was resolved, neither operation presented much of a surgical problem, both being early cases. The original intention in the first case was to do the minimum consistent with relieving the tamponade, but the immediate and dramatic improvement in the patient once the freeing of the visceral pericardium was commenced encouraged us to carry out a full-scale pericardiectomy. In the second case, there was no layer to decorticate, and the



Case II. On discharge.

improvement was seen once the effusion was completely evacuated.

Both cases were very poor-risk patients and in a fairly severe state of cardiac decompensation. Thiopentone, given under such circum-

stances, no matter what dilution is used or how slowly administered, may have fatal results (Dundee, 1956). It was, therefore, considered more expedient to induce the patients in some other way rather than use the quick and convenient intravenous route. Both patients were induced by the method described by Gray and Riding (Gray and Riding, 1957), but with a slight modification in that Suxamethonium was used instead of Curare. This method, originally evolved for the operation of mitral valvulotomy, has proved useful in poor-risk patients because the only agents used are Nitrous Oxide, Oxygen and a muscle relaxant; furthermore, it is easily learnt, and supplies the triad of hypnosis, analgesia and relaxation, with the minimum of toxic effects.

SUMMARY

1. Two cases of pyopericardium are presented.
2. Both were referred for open surgical drainage at a relatively early stage.
3. The anaesthetic problems connected with both cases are discussed.
4. Results were good, indicating that early surgical intervention may be the treatment of choice in such cases.

REFERENCES

- Dundee, J.W. (1956) Thiopentone and other thiobarbiturates. Livingstone, pp 236, 237.
- Gray, T.C. and Riding, J.E. (1957) Anaesthesia for mitral valvulotomy: the evolution of a technique. *Anaesthesia*, 12, 129.
- Rees, G.J. (1958) *Modern trends in Anaesthesia*. Butterworth's, pp 212.