

PROSPECTIVE STUDY OF EMPYEMA THORACIS AT THE

UNIVERSITY TEACHING HOSPITAL

LUSAKA - ZAMBIA

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DEDICATED TO MY WIFE, BEATRICE AND MY CHILDREN

CHIDI, CHINYERE, NDUKA AND KATENDI

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INTRODUCTION

Empyema thoracic has plagued mankind for a long time. Hippocrates recognised and first wrote about this problem some 2,400 years ago. His initial treatment protocol - intercostal incision or rib resection, packing of wound with cloth, and covering the opening with cotton to establish closed drainage, provided the basis of therapeutics until the 20th century (1).

To date empyema remains a difficult problem for clinicians, with high morbidity and mortality and serious drain on hospital resources because of long bed occupancy in the wards. In the West it tended to decrease with the advent of antibiotic era, but later in the 1960's, started to assume a more malignant nature in terms of morbidity and mortality (1). This is explained by two factors: acquiring of resistance to antibiotics by the causative microbes and the increase in thoracic surgical intervention with their attendant complications, during this period. In Lusaka, the increase has been mainly due to increase in pulmonary tuberculosis associated with HIV (2). These patients often present very ill and need early clearance of empyema cavity to reduce toxicity and get them home for management by the Home Care Team to reduce bed burden of the hospital.

BACKGROUND AND LITERATURE REVIEW

Empyema thoracis is a common complication of pulmonary infections, thoracic traumas and surgery, pulmonary tumours and abdominal sepsis. Predisposing aetiological factors to development of empyema vary from one geographical location to the other. It reflects the nature of patient population and community based infection (3). One might add that the level of incidence of other chest pathologies like pulmonary and oesophageal tumours, chest trauma and the intensity of surgical intervention for these conditions has of late assumed a major importance in the aetiopathogenesis of empyema thoracis.

In the advanced countries of the west, empyema was common and difficult problem before the antibiotic era. With introduction of antibiotics and early surgical intervention the incidence decreased, but from the mid-1960s, this trend changed with notable increase in empyema incidence because of development of resistance to antibiotics by the microbes and increase in the thoracic surgical intervention for chest pathologies in major centres (4,5). The incidence per year is now quoted as 12.3 - 14 (4) in major centres of the west. In the developing countries, empyema is still a common problem. It was the commonest pathology seen between 1975 - 80 by the Ibadan Cardiothoracic Unit (6), accounting for 30% of all cases.

In India, Ghosh et al saw 41 cases in 28 months and noted that empyema in the developing countries is a disease of the underprivileged group, in whom infections, malnutrition and inadequacy of health care is prevalent (7).

Theatre records in Lusaka's University Teaching Hospital showed that only 50 cases were dealt with in 1985. This figure went up to 100 by 1990. The emergence of HIV disease epidemic in the 1980's in Zambia has led to increase in the number of patients presenting with pulmonary tuberculosis and other chest infections and consequently increase in empyema thoracis as a complication. Again in 1991 between June and August, 28 cases were referred to the Emergency Theatre for insertion of intercostal drainage for empyema. This figure excludes those treated conservatively in the medical and paediatric wards.

In both the West and developing countries, males are affected twice as females in the adult population (1,4). Adults predominate in the Western series, while children are more affected in Nigeria and India (3,7). The predominance of children in the developing countries' series could be explained by the predisposing aetiological factors to which children are more prone.

Predisposing aetiological factors are mainly infective in the developing countries. These are pneumonia, lung abscesses, abdominal sepsis, amoebic liver abscess, pulmonary tuberculosis, mediasternitis and generalised sepsis. Anaemia and malnutrition play a compromising role. Few cases are seen after thoracic trauma and surgery, and contamination of sterile pleural effusion during diagnostic and therapeutic thoracocentesis. In the west, the situation was the same until the 1940's, when antibiotics and adequate management of infection were put into place (5). Now with the increase in the number of radical intrathoracic surgery being done in most western centres for malignancies and other conditons, postthoracic surgery empyema complications have assumed equal and greater importance to pneumonia in empyema aetiology in these centres (5,4).

Symptoms of empyema thoracis are often insidious and it is usually difficult to assess their duration. It should be suspected in patients with pulmonary infections if there is recurrence of pyrexia despite adequate and suitable antibiotics therapy. In other cases the signs of the primary disease condition may be very slight, that it passès unrecognised and signs of empyema manifest first and predominate.

Symptoms of empyema thoracis are divided into systemic and local features. Systemic features are pyrexia, rigors, sweating, malaise, anorexia and loss of weight. Others are neutrophillic leucocytosis, pallor and tachycardia. Local features include dyspnoea, tachypnoea, pleural pains, cough with purulent sputum, haemoptysis. Physical examination might show unilateral or bilateral affliction, reduced or absent chest wall movement, displacement of mediasternum to the opposite side, stony dull percussion note, diminished or absent breath sounds. There might be pleural rub, vocal resonance may be reduced or occasionally increased.

Radiologically empyema thoracis is difficult to distinguish from other forms of pleural effusion. It demonstrates unilateral or bilateral involvement. There is pleural opacity, fluid level, collapse of affected lung and shift of mediasternum to the opposite side. There may also be signs of lung disease like pneumonic infiltrations, pulmonary tuberculosis, opacifications, cavitations or lung abscesses, pulmonary tumours, bronchiectasis, atelectasis, foreign bodies in the bronchus and pneumothorax.

Aspiration of purulent fluid confirms diagnosis of empyema. Microscopy and culture of which may reveal the bacteria

involved. A diagnosis of empyema thoracis could also be made according to Vianna (1971) if pleural fluid yields bacteria on culture or has white blood cell of more than 15 000 cells per mm³, protein more than 3 gm/L, pH less than 7, glucose less than 40 mg/dL and lactate dehydrogenase more than 1 000 U/L (8).

Organisms commonly cultured from empyema aspirates are:

pneumococcus, streptococcus, staphylococcus, haemophilus influenzae, pseudomonas, escherichia coli, bacteroides, klebsiella mycobacterium, fusobacterium, proteus, corynebacterium and acinobacter, Fungi and protozoa may also be isolated.

Pleural biopsy with Abram's needle or during surgical procedures may help in diagnosing histologically the aetiological factor of empyema thoracis. Both layers of pleura are usually covered with thick shaggy inflammatory exudate. The pus in the pleura is often under tension and if not treated early and adequately may rupture into the bronchus to form broncho-pleural fistula and pneumothorax. The rupture may also be into the subcutaneous tissue to form empyema necessistans and finally sinus. The pus in the pleural cavity may be in a single cavity or might be in separate fibrous loculi. The only way an empyema can heal is by apposition of the visceral and parietal layers of the pleura with obliteration of the empyema space. This cannot occur unless re-expansion of the collapsed lung is achieved at an early stage by removal of all pus from the pleural space. Re-expansion cannot take place if:-

1. through delay in treatment or inadequate drainage, the visceral pleura becomes grossly thickened and rigid
2. the pleural layers are kept apart by air entering the pleura through a broncho-pleural fistula
3. the primary lung disease like bronchiectasis, bronchial carcinoma or pulmonary tuberculosis renders it incapable of re-expansion.

In all these cases, empyema tends to become chronic and healing may not take place without a major surgical intervention.

Management options for empyema thoracis range from antibiotics, thoracocentesis and tube thoracostomy with underwater sealed drainage for simple post pneumonic empyemas, to rib resection, decortication, Eloesar flap, pleurodesis and thoracotomy with muscle or omental transposition in chronic cases with loculi, pleural thickening and bronchopleural fistula. There is a new trend in the west to use thoracoscopic debridement and antibiotic irrigation of empyema thoracis as an initial treatment option (4). Results are said to be very impressive. The only few failures occurred where the underlying condition has been malignancies.

Complications of empyema thoracis include broncho-pleural fistula, empyema necessitans, chronic discharging sinus, chronic respiratory insufficiency and septicaemia.

OBJECTIVE OF THE RESEARCH

The objective of this research is to study the aetiological factors and immediate postoperative outcome of empyema thoracis prospectively at the University Teaching Hospital, Lusaka , Zambia.

RATIONALE

In recent years empyema thoracis has become a major problem at the University Teaching Hospital, Lusaka (2,9). With the HIV epidemic in Zambia and consequent increase in the number of pulmonary tuberculosis cases and other chest infections and sepsis, there has been a big increase in the number of empyema cases referred to the Surgical Units for management. Theatre records showed that in 1985 50 cases of empyema were handled by the Surgical Units. This number rose to 100 by 1990. Records at the University Teaching Hospital emergency theatre showed that between August and October 1991, 28 cases of empyema thoracis were referred for intercostal drainage procedures. These figures do not reflect the whole picture. Most patients never get referred from the medical and paediatric wards, where attempts are made to manage them conservatively.

Available figures from literature from other parts of the world are lower than those seen at the moment in Lusaka. For instance, Leblanc et al traced only 74 cases between 1970 to 1981 at State University of Louisiana. Odelowo et al found 178 patients in a study conducted over 1978 and 1986 at two University Teaching Hospitals in Nigeria. Benfield harvested an average of

12.3 patients per year between 1968 and 1978 at Llandough in Wales (10, 3, 5). It has to be emphasized that these figures from other parts of the world predate the AIDS epidemic. It would be interesting to see the situation in these centres during an AIDS epidemic.

Despite this high incidence of empyema thoracis at Lusaka, there has not been any study on the aetiological factors involved. A management strategy has been suggested by Mr Desai and Dr Mugala (BR. J. SURG. 1992, Vol 79) here in Lusaka. Applying this strategy and examining the outcome might help formulate a management strategy in Lusaka and help to decongest the already overburdened hospital facilities.

Thus the rationale for this study is the need to assess aetiological factors of a common problem at the University Teaching Hospital, Lusaka and see the immediate postoperative outcome of empyema thoracis using a modified management strategy (2).

METHOD AND MATERIAL

This prospective study was carried out at the University Teaching Hospital, Lusaka between the 1st February and 30th August, 1992. 50 patients were involved. They were referred from the Surgical, Medical and Paediatric Units and Chest Clinic of the hospital. Notifications were earlier sent to these Units to refer all empyema thoracis cases to me directly or through one of the Surgical Units

with an interest in thoracic pathologies. The patients were admitted and managed postoperatively in this unit until their discharge from hospital. They were later followed up on Thursday afternoons at the Surgical Clinic until their final discharge after the closure of the sinus and they had at least a two third lung expansion and no signs of toxicity.

The criteria for inclusion in the study was aspiration of purulent fluid from the pleural cavity. The use of cell counts, level of proteins and glucose, pH and lactate dehydrogenase as a method of diagnosis of empyema thoracis in our setting, was thought inappropriate because of possible problems from the laboratories.

Names, age, sex, residential address and occupation were noted. Full history and clinical examination were undertaken to ascertain presentation, association with various chest diseases, trauma, surgery and other systemic conditons. Medications and previous admissions were noted. Blood was obtained, after consent for full blood count and HIV serology. Testings for HIV antibody were done using competitive enzyme linked immunosorbent assay (ELISA) - Welcome recombinant Elisa, new generation and noncompetitive Elisa (Abbot HIV 1st and 2). Doubtful results were rechecked with Western Blot method.

Pus aspirates were obtained on admission or during thoracostomy in a plain sterile container and in another sterile container with thioglycolate for aerobic and anaerobic culture and microscopy

in the laboratory. The specimens were sent by the Author personally to the Laboratory with minimum delay as the laboratory had a 24 hour shift.

The aspirates were centrifuged and deposits were inoculated on two blood agar plates and Mac Conkey agar and into cooked meat broth or thioglycolate broth. One blood agar plate and Mac Conkey were incubated in air plus 5 - 10% oxygen and the other anaerobically plus two percent carbon dioxide at 35 - 37C overnight. The cooked meat broth or thioglycolate media were subcultured onto blood media and Mac Conkey agar after overnight incubation. The plates were examined for growth and identification of microbes after 24 and 48 hours.

Another specimen from the aspirate was sent to the Chelston Mycobacterial Laboratory for microscopy and culture for Acid, Alcohol Fast Bacilli (AAFB).

During the aspiration of the empyema fluid, a note was made about the viscosity of the pus as per how easily it was aspirated through a 21 French gauge needle into a 10 cc syringe. Easy flow (low viscosity), was defined as filling of the syringe by one pull on the plunger. The flow was defined as difficult if two or more pulls were required (2). This was important in subsequent allocation of patients to treatment groups.

Chest x-rays were taken on admission to confirm radiologically the presence of empyema thoracis and other chest conditions. Other chest x-rays were taken subsequently to ascertain re-expansion

of the lung before discharge from hospital and during reviews in the clinic.

Pleural biopsies were obtained by open method during rib resections and decortication. In the process of insertion of interthoracic drains, a pleural biopsy was obtained by the use of an artery forceps through the incision before insertion of the thoracostomy tube. Patients treated by aspiration alone had no pleural biopsies taken as Abram biopsy needle was not available.

Patients were admitted and managed from one of the Surgical Units wards postoperatively. For the purpose of grouping patients into those to be treated by thoracostomy and underwater sealed drainage and primary rib resection with open drainage, viscosity of the aspirate was used as determined by easy or difficult aspiration through a 21 French gauge needle as stated above. Those with easy aspiration were treated with tube thoracostomy and underwater sealed drainage. Those with difficult aspiration were treated with primary rib resection and open drainage. For adults a No. 32 French chest tube with a diameter of 1cm was used. Insertion for adults was done under local infiltration anaesthesia with 0.5% lignocaine. For children, a tube of 6 mm diameter was used under general anaesthesia. Rib resection was done under general anaesthesia. Usually 5 - 6 cm of the 7th and 8th ribs were resected subperiosteally at the posterior axillary line. A window 6 x 5 cm was made by removing all the interposing soft tissues. Through this opening the empyema cavity is debrided using a swab on a stick and later lavaged with saline until clear

fluid was obtained. The wound was then left to drain as an open wound on the chest wall. Some patients who presented very late in very poor general condition were aspirated only.

R E S U L T

The study include 50 patients with purulent pleural effusion. There were 33 males and 17 females, given a ratio of nearly 2 : 1. their age and sex distribution are shown in fig. I All but three patients were from Lusaka and surrounding areas. Most came from high density areas around Lusaka. Majority were self employed, housewives or had no job and were dependent on relatives. Only five percent were in formal employment.

HISTOGRAM SHOWING AGE AND SEX DISTRIBUTION OF PATIENTS

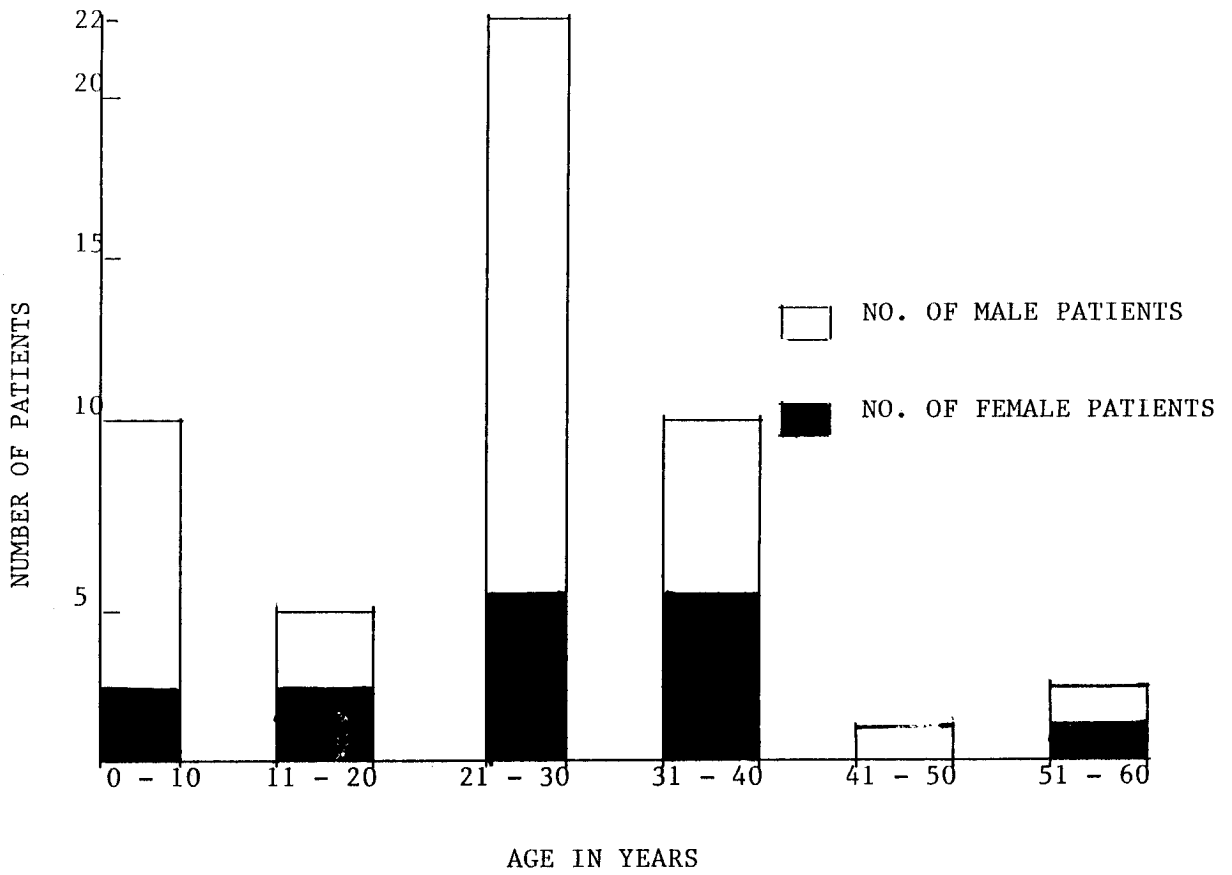


FIGURE I

PRESENTING SYMPTOMS

Durations of symptoms before presentation ranged from one to a hundred days with an average of twenty one days. All the 50 patients had unilateral empyemas. There were three cases on empyema necessitans. Two patients had recurrent empyema. Onset was acute in twenty while thirty patients presented with insidious onset.

The most common presenting symptoms were; dyspnoea in 39, cough in 32, pyrexia in 30, chest pain and weight loss in 29 and 27 respectively, occurrence of other symptoms is shown in Fig. 2.

PRESENTING SYMPTOMS

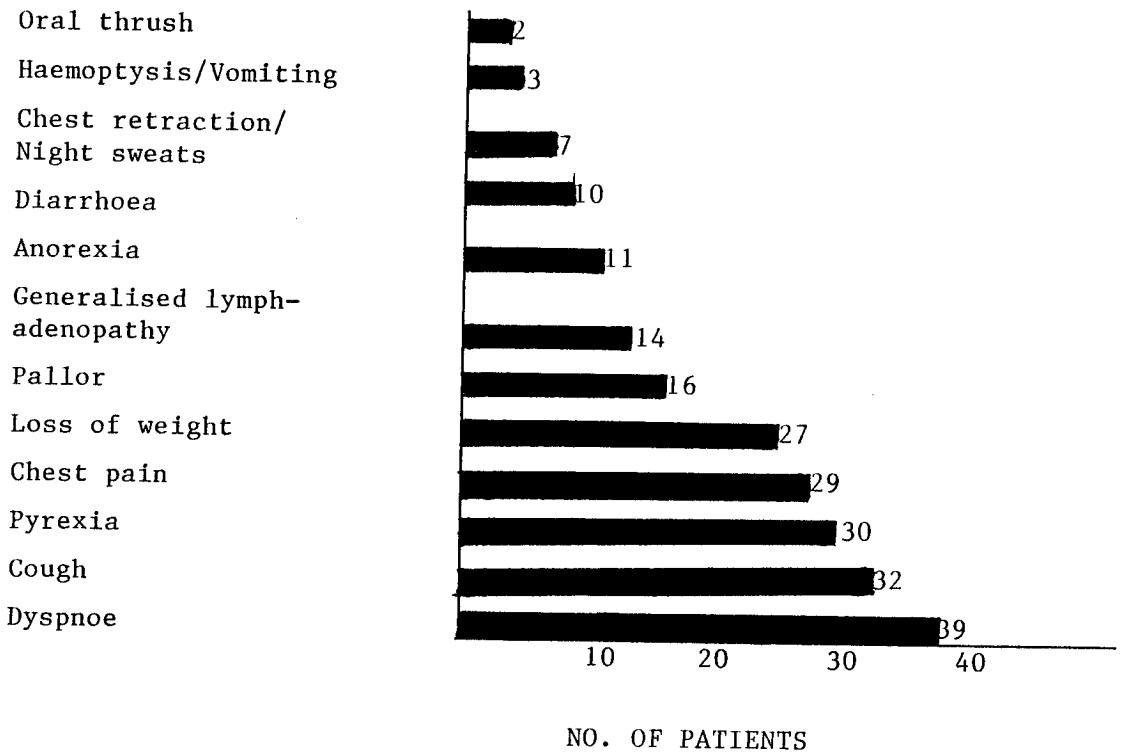


FIG. 2

PREDISPOSING AETIOLOGICAL FACTORS

Aetiological factors are shown on Fig. 3.

Pulmonary tuberculosis was the aetiological factor in twenty two cases, pneumonia is eighteen, contamination of pneumothorax due to chest trauma in five, puerperal sepsis in two contamination of sterile pleural effusion during diagnostic thoracocentesis in one, postlaparotomy for intestinal obstruction, peritonitis, congestive cardiac failure and umbilical sepsis one each. The umbilical sepsis case also had pneumonia.

Pulmonary tuberculosis was diagnosed in thirteen patients with positive sputum, lung opacities on radiography and clinical presentation. In the remaining nine patients, tuberculosis was diagnosed on the basis of lung opacities on radiography, clinical presentation of long standing cough, haemoptysis, night sweats and loss of weight. Three out of these nine had positive pleural biopsy for tuberculosis.

Pneumonia was diagnosed by acute presentation of chest infection with radiological infiltrations which cleared within one week of chemotherapy.

Three of the five chest trauma were penetrating wounds. Two due to animal bites and one due to stab wound on the chest. The remaining two were closed injuries due to road traffic accidents.

Diabetes mellitus and Kaposi Sarcoma coexisted in two cases of pulmonary tuberculosis, herpes zoster in a pneumonia patient and a pulmonary tuberculosis patient. In two children with pneumonia, anaemia and malnutrition were compounding factors. Four patients also had hepatosplenomegaly.

AETIOLOGICAL FACTORS IN THE PATIENTS

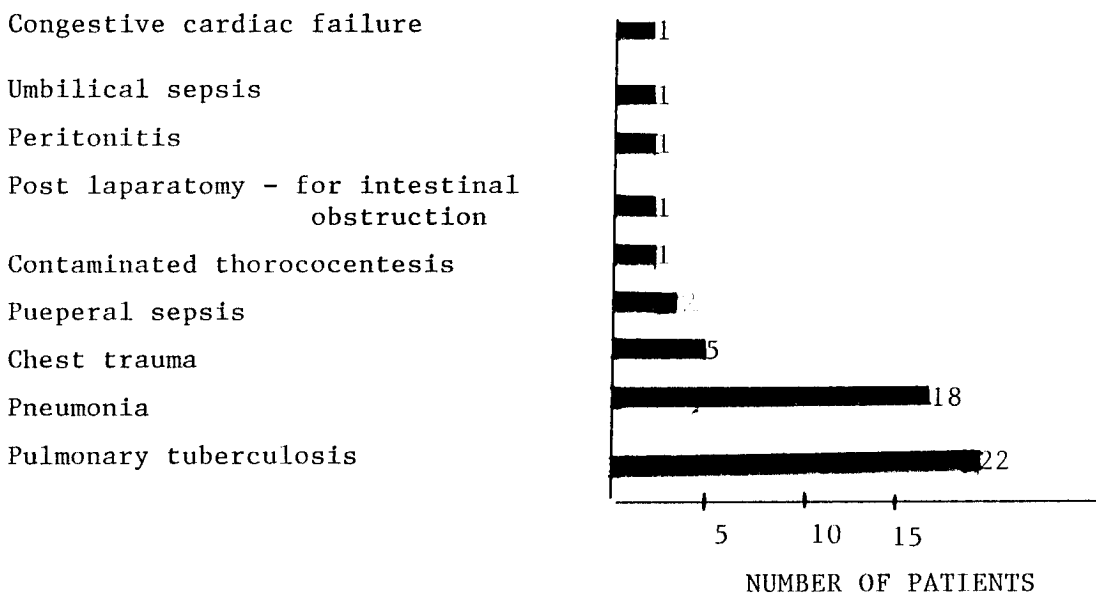


FIG. 3

HIV SEROLOGY

Twenty eight patients were HIV positive, while twenty two tested negative. There were 18 male HIV positives to 10 females. There were only two HIV positives out of the eleven children in this study. Of the twenty two, pulmonary tuberculosis patients, eighteen tested HIV positive.

Twenty of the twenty eight HIV positive patients could be clinically identified as having AIDS using the World Health Organisation Interim Proposal for Staging of HIV Disease of July, 1990, which takes into account the presence of generalised persistent lymphadenopathy, marked weight loss of more than 10% body weight, prolonged unexplained pyrexia, oral thrush, chronic diarrhoea, pulmonary tuberculosis, typical mucocutaneous lesions and a major infection focus (10).

BACTERIOLOGY

Aspirates were obtained from all the fifty patients and sent to the laboratory for aerobic and anaerobic microscopy and culture. Twenty two were reported as sterile. The organisms cultured are shown in Fig. 4. Three aspirates had mixed growths: *Salmonella* and *Streptococcus faecalis* in a pulmonary tuberculosis patient, who also had diabetes mellitus and was HIV positive; Beta-haemolytic streptococcus and acinobacter species in a chest trauma patient and *Escherichia coli* and *Staphylococcus aureus* in haemothorax due to road traffic accident. Aspirates from thirteen out of twenty two pulmonary tuberculosis patients yielded growths of aerobes, but there were no yield of AAFB from all the aspirates sent to the mycobacteria laboratory.

BACTERIA CULTURED FROM ASPIRATES

NO.	BACTERIA CULTURED	NUMBER	%
1.	Staphylococcus aureus	6	20
2.	Beta-haemolytic streptococcus group A	6	20
3.	Escherichia Coli	4	13.3
4.	Acinobacter	4	13.3
5.	Proteus	3	10
6.	Salmonella specie	2	10
7.	Streptococcus pneumonia	2	6.6
8.	Streptococcus faecalis	2	6.6
9.	Streptococcus viridans	1	3.3
	No growth	22	

FIG. 4

PLEURAL BIOPSY

Pleural biopsy was obtained in all but three patients treated by aspiration because of their poor general condition on presentation. However results of only thirty histology reports could be traced from the Pathology Department.

Twenty specimens showed non specific pleuritis while ten were caseating tuberculous pleuritis. Seven of the thirteen sputum positive PTB patients had confirmatory pleural biopsy, while only three of sputum negative PTB diagnosed on clinical and radiological signs were confirmed as having caseating pleuritis.

MANAGEMENT

All patients were at least on one and in most cases two antibiotics before they were recruited. The antibiotics ranged from Gentamicin, Septrin, Cloxacillin, Clofaran to Penicillin and Tetracycline. The PTB patients were all on antituberculous regimens which included Streptomycin, Isoniazid, Ethambutol, Rifatar and Pyrazinamide.

Three patients were managed by aspiration and antibiotics in the medical and paediatric wards because of their poor general condition on presentation.

Thirty seven patients were managed with tube thoracostomy and underwater sealed drainage, out of which five had to be converted to rib resection and open drainage, because of failure of lung expansion within two weeks.

Nine patients had primary rib resection and open drainage.

Only one patient with recurrent empyema due to PTB had decortication. The thoracostomy patients were sent home as soon as there was clinically and radiologically evidence of lung expansion. The

rib resection patients were sent home when they had two-thirds lung expansion and there were no signs of toxicity. Both groups were then reviewed as outpatients until the fistula closed.

MANAGEMENT AND OUTCOME OF EMPYEMA

METHOD	NO.	OUTCOME	REMARKS
Aspirations	3	All Deaths	Poor general condition
Thoracostomy and under water sealed drainage	37	32 full lung expansion 5 failure of lung expansion 5 deaths.	5 patients converted to rib-resection
Rib resection and open drainage	14	No deaths, all achieved two-thirds to full lung expansion. No toxicity.	No complication from open drainage
Decortication	1	Two-third lung expansion. No toxicity.	Recurrent empyema case.

FIG. 5



Average hospital stay was 14 days, with a range of 9 - 40 days. There were eight mortalities from empyema and associated conditons. Three of these patients died in the medical and paediatric wards having been aspirated only because of their poor condition on presentation. Of the eight mortalities, four were male and four female. Six were not only HIV positive, but had AIDS by WHO classification (10). One of the patients, who was HIV negative had a long standing PTB with diabetes mellitus. Three patients had pulmonary tuberculosis as predisposing aetiological factor, three had sepsis which could have been facilitated by their HIV positive status. Two female patients developed puerperal sepsis shortly after delivery and a two weeks old baby developed generalised sepsis from an umbilical stump infection. It is a regular observation that pregnancy and other major stress situations accelarate the development of AIDS in HIV positive patients at the University Teaching Hospital, Lusaka. Two of the AIDS patients had associated Kaposi Sarcoma and Herpes Zoster. Only the three months old child with pneumonia and anaemia had staphylococcus cultured from her aspirate. All other mortalities had sterile aspirates. This could be because they were all on various kinds of antibiotics before being recruited. The antibiotics ranged from Gantamicin, Crystalline Penicillin, Cloxacillin, Claforan to Ampicillin and Septrin.

ANALYSIS OF MORTALITIES

AGE/ SEX	AETIOLOGICAL FACTORS	HIV STATUS	ASPIRATE BACTERIO- LOGY	ANTIBIOTIC BEFORE RECRUIT- MENT	MANAGE- MENT OF EMPYEMA	DURATION OF STAY IN HOSP- TAL
M/23	PTB in assoc. with Kaposi Sarcoma	+ve	No growth	ATT Septrin	I C D	3 weeks
M/2 52	Umbilical sepsis + Pneumonia	+ve	No growth	Gentamycin Claforan Cloxacillin	ASP	7 days in N I C U
M/36	PTB with Diabetes mellitus	-ve	No growth	ATT	I C D	3 days
M/42	Pneumonia with herpes Zooster	+ve	No growth	Gentamycin Cloxacillin	I C D	10 days
F/23	Pueperal sepsis	+ve	No growth	Gentamycin Cloxacillin Penicillin	I C D	13 days
F/32	Pueperal sepsis	+ve	No growth	Gentamycin Cloxacillin	I C D	10 days
F/36	PTB with Pneumonia	+ve	No growth	ATT Septrin	ASP	6 days
F/3 12	Pneumonia Anaemia	-ve	Staphylo- coccus aurens	Gentamycin Cloxacillin Penicillin	ASP	6 days

ATT - Anti Tuberculous Therapy

ASP - Aspiration

ICD - Intercostal Drainage

+ve - Positive

-ve - Negative

Forty two patients were discharged home from hospital to continue their review at the surgical clinic. Five patients never turned up for reviews at the clinic. The remaining patients were followed-up until their chest wall sinuses stopped discharging and healed. This period ranged from two to sixteen weeks for patients treated by tube thoracostomy, up to 24 weeks for patients treated with rib resections. There were no readmissions for recurrent empyema during the period of follow up. The most notable complications in HIV positive patients were long standing discharging sinus on the chest wall even when the lungs were fully expanded radiologically and there was good air entry.

DISCUSSION

Empyema thoracis has become a major problem for both physicians and surgeons at the University Teaching Hospital, Lusaka. There has been a big rise in the incidence of pulmonary tuberculosis and empyema thoracis in Lusaka with the emergence of the HIV epidemic in Zambia (2,9). HIV infection has a strong association with pulmonary infection, particularly tuberculosis with which in 1990 it was associated in 49% of cases in Lusaka (9). Surgeons at the University Teaching Hospital dealt with only 50 cases of empyema thoracis in 1985. By 1990 this figure went up to 100 and there is an upward trend each year.

Male to female ratio in this study is about 2 : 1 and conforms with other series of empyema studies done before the HIV epidemic (4,5). One striking observation is the predominance of young adults in their productive age in the study, with age of two weeks

to sixty years, 70% of the patients were between twenty and fifty years, with mean age of the adult patients as 29.4 years.

The predominance of this age group in this series could be explained by the fact that the main predisposing aetiological factor was pulmonary tuberculosis and HIV disease, which is common in this sexually active age group in Lusaka. An earlier study by Desai showed the same trend (2).

The implication of this is that apart from the drain on the hospital resources by their long stay in hospital, national and family income suffer by the long absence from production of these productive age group. Predisposing aetiological factors were mainly infective as is the case with other developing countries, where infectious diseases predominate over other pathologies and patients have limited access to health facilities. Late presentation is the rule in few available centres (3,12,13). Again there are few thoracic surgical procedures going on in our centres, pulmonary tumours are rare. Oesophageal tumours present at advanced stages that the only option is palliative treatment. So complications of thoracic surgery as seen in western centres are non existent.

The aetiological factors in this series have their own peculiarities. In no published series has pulmonary tuberculosis been seen to be the predominant infective aetiological factor, and sepsis related to HIV infection has been isolated as a factor

leading to development of empyema. It is common clinical observation at Lusaka that the stress of pregnancy and major surgery often makes HIV positive patients develop AIDS. Pulmonary tuberculosis accounting for 44% of the cases, has overtaken pneumonia (36%), as the leading infective predisposing factor. There were three cases of sepsis related to HIV as a predisposing aetiological factor. They included two females with puerperal sepsis and a two weeks' old neonate whose sepsis started from the umbilical stump. All three HIV related sepsis patients died. The synergism of HIV infection and pulmonary tuberculosis in Zambia has been demonstrated by Elliot et al (9). As far back as 1990 they found 49% HIV seropositivity rate in Zambian confirmed pulmonary tuberculosis patients and 81% in those with pleural diseases. In a series of 39 empyema patients studied by Mr Desai and Dr. Mugala between 1989 and 1990, they found a HIV positivity rate of 66.6% (2). This has been confirmed by this study with 56% positivity rate amongst the empyema patients and 81.8% HIV positivity rate in the pulmonary tuberculosis patients.

Chest trauma with associated haemopneumothorax drainage was not very significant in empyema aetiology in Lusaka. Animal bites and road traffic accident were the main causes in the five cases we had. A lot of crocodiles and lions exist in Zambia.

Pus aspirates were sterile in 44% of the cases and no AAFB could be cultured in all pleural aspirates. High sterility rates have often been reported in empyema patients (12,1). Akinsanya et al (12) found a 70% sterile pus in his adult patients in Lagos; Wesse et al (1) found 30 - 40% of his 115 aspirates sterile. The high sterility rate in this study could in the main be due to the fact that all patients were on various kinds of antibiotics in the medical, paediatric and surgical wards before being recruited. The non isolation of anaerobes from empyema aspirates has been blamed on inadequate methods of preservation of oxygen sensitive organisms during transfer to laboratory and lack of adequate anaerobic culture techniques. This situation led Bartlett et al (14), to search for anaerobes in empyema aspirates. They found anaerobes in 76% of the 83 aspirates studied. The notable condition here was that only adult patients who had recieved no antibiotics were acceptable in their study. In contrast all the patients in this study had antibiotics to which anaerobes could have been sensitive. *Streptococcus faecal* isolated in two aspirates was the only anaerobe in this series.

Mycobacterium tuberculosis is rarely isolated from empyema pus aspirates. Like in this series Akinsanya et al also found none (12). It is not the recommended place to look for *mycobacterium tuberculosis*.

Staphylococcus and Streptococcus along with some gram negative bacilli were the main organisms isolated despite the antibiotics treatment before pus aspiration was done. One could speculate here that there is either poor penetration of antibiotics to the large pus in the pleura and avascular necrotic capsule surrounding it or that these organisms have acquired resistance to repeated use of antibiotics.

The lack of Abram's biopsy needle should not preclude pleural biopsy in empyema patients. They could be obtained using curved artery forceps and grasping a piece of parietal pleura through an incision made for insertion of chest tube or during rib resections and decortications. The non tracing of seventeen histology results demonstrates the problem in delivering histology specimens from the theatre to the laboratory. Seven of the thirteen sputum positive PTB cases and three of the nine radiologically diagnosed PTB patients could be confirmed histologically in the available reports.

Management of empyema thoracis remains contentious and controversial. There is however a consensus of opinion by most empyema surgeons that primary post-pneumonic empyema should be treated by less radical thoracocentesis and closed tube thoracostomy, while chronic and post-pneumectomy empyema should be subjected to more radical methods (11, 4, 14, 15).

Decortication and more radical surgery give good results in fit patients, but can be accompanied by high morbidity and mortality in toxic and debilitated patients to which most of our HIV positive and AIDS patients belong. It was with this in mind that the strategy of defining viscoscosity of pus by needle aspiration and grouping of patients into treatment groups was adopted. Of the 37 patients with easy aspiration, 32 were treated only with closed tube thoracostomy, 27 being cured and five dying from their empyema. The other five from this group had rib resections because of failure of lung expansion and persistent drainage after two weeks. The fourteen patients who had this modified rib resection, which involved clearance of empyema cavity of fibrinopurulent accumulation and saline irrigation, became less toxic within a few days and were able to leave hospital with a hole in the chest within one week. There were no mortalities in this group. This method, while achieving clearance of the empyema cavity, is less radical than formal decortication and well tolerated by debilitated patients, and so recommended in patients with thick pus aspirates and in those whose lungs fail to expand on closed thoracostomy drainage after two weeks. The only patient who underwent decortication was an HIV negative with recurrent empyema with PTB. He recovered well with 66% lung expansion and no toxicity.

Follow ups and reviews were encouraging in the group of patients at least up to closure of chest sinus. This was probably due to fear of having a discharging sinus on the chest wall. Early discharge of patients treated as above is recommended as soon as they are less toxic. This will decongest the surgical wards of these otherwise long bea occupying patients and minimise work load on the few over worked nurses in the hospital.

The mortality in this series of sixteen percent falls within quoted empyema mortality of between ten and fifty percent despite the peculiar nature of our patient population (16). Clinical observations in Lusaka show that HIV patients tolerate minor to moderate surgical procedures in most cases, but may be adversely affected by major and more radical surgery. Hence the adoption and recommendation of less radical form of clearance of empyema cavity in those patients with thick and loculated empyema. The complication of long-standing discharging sinus is well managed by patients. The sinus was packed with gauze or cotton before dressing up and patients went on with their normal daily routine undisturbed.

CONCLUSION

Empyema thoracis has become a major problem at the University Teaching Hospital, Lusaka. The main predisposing aetiological factors are pulmonary tuberculosis and pneumonias arising as a complication of HIV disease which became epidemic in Zambia in the 1980's. Most patients are young and in their productive age. Males being affected nearly twice as females. Most patients improved on closed tube thoracostomy and modified form of rib resection and were able to leave hospital early to continue treatment as outpatients.

Adoption of viscosity of pus as a criteria for grouping of patient into those to be managed with tube thoracostomy or rib resection is recommended. I also suggest that in very sick patients with thick pus, rib resection with clearance of fibrinopurulent exudate and saline irrigation instead of decortication. These methods proved very useful in this series with very low failure rates.

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