VENOUS LIGATION FOR SEPTIC PULMONARY EMBOLI FOLLOWING SUPPURATIVE PELVIC THROMBOPHLEBITIS

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Ligation of the inferior vena cava, for pyaemic metastatic abscesses due to septic emboli from suppurative pelvic thrombophlebitis, is not a new procedure. Despite the control and eradication of pyaemia in obstetrical and gynaecological practice, there exists a small number of cases where ligation of the venous drainage from the pelvis may be a life-saving measure.

In cases of puerperal pyaemia, Trendelenburg and Miller demonstrated the presence of palpable thrombosed veins at operation. They ligated these individual veins proximal to the thrombus. Uninvolved branches of the inferior vena cava and ovarian veins were not ligated. As their mortality rates were only slightly better than those following expectant therapy, this method fell into disrepute.

However, it was Collins et al. who showed that surgical ligation could be highly successful in cases of pyaemia, even though medical treatment had failed. This they achieved, by completely interrupting the venous return from the uterus and ovaries by ligating the inferior vena cava and the ovarian vessels, irrespective of the site of the venous thrombophlebitis.

Five cases of septic pulmonary emboli following suppurative pelvic thrombosis are presented. Conservative treatment had failed, and ligation of the inferior vena cava was considerably beneficial and a life-saving procedure.
CASE REPORTS

Case 1

A 27-year-old Bantu female, gravida 2, was readmitted to hospital on 18 January 1963, after having had a curettage 6 days previously for an incomplete abortion. She was severely ill with lower abdominal pain, rigors, and pelvic peritonitis. Her temperature was 102.2°F, pulse rate 152 per minute, and respiratory rate 36 per minute.

Progress. In spite of numerous antibiotics and blood transfusions (Fig. 1 and Table I) her condition showed further deterioration. The persistent anaemia was due to infection, as there was no blood loss or haemolyisis, and responded only to frequent blood transfusions.

On 4 February 1963, she developed a cough productive of purulent sputum. An X-ray film (Fig. 2) showed multiple lung abscesses on the right side. Blood, cervical and sputum cultures grew a profuse growth of *Escherichia coli*.

Five days later, with her pulse rate 160 per minute and respirations 46 per minute, the inferior vena cava was ligated under general anaesthesia. The vessel was approached extraperitoneally through a right transverse oblique incision, and ligated 2.5 cm. below the entrance of the renal veins with 2 ligatures of 0.3 chromic catgut. The vessel appeared healthy.

Postoperatively, the fall in blood pressure was corrected by raising the foot of the bed and administering phenylephrine intravenously. A dramatic improvement in the patient’s condition occurred. The pulse rate was 100 per minute and respirations 24 per minute. There was no oedema of the legs.

On 13 February 1963 she developed a persistent massive haemoptysis, and a right middle and lower lobe lobectomy was performed. The specimen of lung tissue removed showed 2 abscess cavities, and organized septic thrombus in the branches of the inferior pulmonary vein.

Convalescence was uneventful until 19 February 1963, when she suddenly became dyspnoeic and died. Autopsy showed the right bronchial stump had ruptured, producing a tension pneumothorax. The uterus contained a number of organizing intramural abscesses. There was a large right tubo-ovarian abscess (culture produced a profuse growth of *E. coli*). The inferior vena cava showed no evidence of thrombus formation above or below the ligature.

Case 2

A 25-year-old Bantu female, para 3, gravida 4, was admitted on 31 December 1963 with pelvic peritonitis.

Progress (Fig. 3). The patient required frequent blood transfusions for the refractory anaemia. Her general condition did not improve on conservative treatment, although the pelvic tenderness had completely regressed.

She became jaundiced on 13 January 1964 and this diminished only after operation (Table II). The blood urea was not raised.

On 20 January 1964 she developed left-sided chest pain and an X-ray of the chest on this occasion (Fig. 4) showed numerous bilateral lung abscesses. Nine days later the inferior vena cava was ligated by the extraperitoneal approach. The vessel was healthy. She made a rapid and uneventful recovery after this procedure and was discharged on the 13th postoperative day.

Blood cultures were persistently negative. However, the sputum and cervical discharge produced an abundant growth of *E. coli*.

Case 3

A 30-year-old Bantu female, para 1, was admitted to hospital on 6 February 1964. She had a criminal abortion 17 days previously, and this was followed by rigors.

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**Fig. 1.** Temperature chart of patient who died following rupture of the bronchus.

**Fig. 2.** X-ray of the chest showing abscesses in the right upper, middle and lower lobes.

**Fig. 3.** Temperature chart showing lack of response to various antibiotics.

**Fig. 4.** X-ray of the chest showing abscesses in the right upper, middle and lower lobes.
She was desperately ill with rigors, anaemia, jaundice, and obvious weight loss. Apart from a thrombophlebitis of the right leg there were no other abnormal signs. An X-ray film of the chest showed small areas of patchy consolidation in both lungs. These later broke down to form small abscess cavities. Culture of the sputum showed *Bacillus proteus*. Blood cultures were negative.

Fig. 4. X-ray of the chest showing numerous cavities in both lung fields.

There was no improvement on antibiotics and blood transfusions, and as the jaundice was becoming deeper, the inferior vena cava was ligated on 15 February 1964. A periphlebitis was observed and thrombi palpated in the vessel. There was a dramatic improvement in the patient's general condition. The day after operation the temperature was normal for the first time since admission, and the pulse and respirations were much slower.

A few days postoperatively she developed thrombophlebitis of the left leg. She was discharged from hospital on 28 March 1964 with bilateral pedal oedema and abdominal varicosities.

Case 4

A 23-year-old Bantu female, para 3, gravida 4, had a curettage on 3 February 1964 for an incomplete criminal abortion. She was readmitted on 11 February 1964 with bilateral salpingo-oophoritis and pelvic peritonitis. There was an oliguria (urinary output 400 ml per 24 hours).

Special investigations. Haemoglobin 7.6 G/100 ml, serum bilirubin 14.4 mg./100 ml (direct 13.6 mg./100 ml); blood urea 79 mg./100 ml. *Staphylococcus pyogenes* was cultured from the sputum and *E. coli* from the cervix.

The acute renal failure was managed conservatively by restriction of fluids and protein (Table III) and by allowing 150 G lactose per day. On 27 February 1964 she developed a productive cough with purulent sputum. A chest X-ray showed multiple lung abscesses. On 10 March 1964 there was further deterioration in the patient's condition. Her jaundice had increased (bilirubin 19.8 mg./100 ml) and she had required 5,000 ml of blood during her stay in hospital. Ligations of the inferior vena cava via the extraperitoneal approach was performed. There was a mild periphlebitis, but no thrombus formation.

There was an immediate improvement in the patient's condition. The lung abscesses resolved with the aid of postural drainage and physiotherapy. The fever subsided 6 days after operation (Fig. 5).

Case 5

A 19-year-old Bantu female, para 1, gravida 1, had a normal pregnancy and uncomplicated confinement on 27 March 1964. Four days later she appeared to be very ill with a high temperature (Fig. 6) and a rapid pulse and respiration. She had a right parametritis.

An X-ray film of the chest showed an opacity in the right lower lobe suggestive of 'pneumonitis'. There was no improvement with therapy and further X-ray (Fig. 7) showed a solitary lung abscess in the right lower lobe. Rigors persisted and she

Fig. 7. X-ray of the chest showing a solitary lung abscess in the right lower lobe.
developed jaundice (serum bilirubin 10 mg./100 ml., direct 72 mg./100 ml.). On 20 April 1964 ligation of the inferior vena cava and ovarian veins was performed. An intraperitoneal approach was used, but as the inferior vena cava was bound down by adhesions, it could not be identified and this route was abandoned in favour of the intraperitoneal approach. There was evidence of a pelvic peritonitis and bilateral salpingo-oophoritis.

There was a dramatic improvement (Fig. 6) and the patient was discharged well. She required 4,800 ml. of blood during the course of her illness. Cultures from the cervix revealed \( \text{E. coli} \). Blood cultures were positive on 10 occasions, showing \( \text{S. pyogenes} \) and \( \text{E. coli} \).

**DISCUSSION**

The 5 cases of septic pulmonary emboli and infarction following on suppurative pelvic thrombophlebitis were seriously ill. All had high swinging temperatures and deterioration was noted in spite of the antibiotics used. In some cases the dosage of antibiotic used was greater than that generally recommended for severe infection. The patients all had severe persistent anaemia, which responded only to frequent blood transfusions. From previous personal experience of this condition, it is felt that the majority of these patients would have died, had not ligation of the inferior vena cava been performed. Some of the effects after ligation were dramatic, as shown by a rapid improvement in their general state, temperature, pulse and respiration rates.

However, in our experience, not all cases with evidence of pyaemic emboli have a fatal outcome. \(^4\) Neuhof and Aufses \(^5\) reported 2 cases of pyaemic lung abscesses, demonstrated by radiology, which survived after being treated with sulphonamides.

In retrospective analysis there was considerable delay before venous ligation was performed in our cases (from 9 to 30 days after admission to hospital). In a series of 70 cases of suppurative pelvic thrombophlebitis treated by ligation of the inferior vena cava and ovarian veins, recovery was complete in 89% of cases. \(^6\) The 8 deaths were caused by metastatic septic foci, related in 4 to delay in operation. These results tend to place proximal venous ligation on a solid foundation.

According to Collins et al. \(^7\), the indications for venous ligation in suppurative pelvic thrombophlebitis are:

1. Failure of the fever to respond to 4-5 days of medical treatment.
3. Evidence of pulmonary infarction on admission, when operation is immediately performed.

Our indications for ligation are:

- (a) Evidence of septic pyaemic emboli with pulmonary infarction demonstrated by radiology.
- (b) Poor or no response to medical treatment.
- (c) Jaundice and persistent or refractory anaemia.

We do not consider ligation in cases of septicaemia without evidence of pulmonary infarction (see above). If there is evidence of pulmonary infarction on admission (see 2 above) we would advise conservative treatment in the first instance, and only ligate the inferior vena cava if there is any deterioration in the patient’s condition.

Suppurative pelvic thrombophlebitis is a distinct entity resulting from sepsis affecting the pelvic veins, and may occur independently of thrombosis in the veins of the leg. \(^8\) This results in purulent thrombi, which tend to break off in showers as small infected emboli. This can occur under treatment with antibiotics (all our cases) or even if anticoagulants have been administered. We did not use anticoagulants in any of the cases as there is a greater risk of haemorrhage in septic emboli and septicaemia.

The diagnosis of the condition is often difficult, and a constant awareness of the possibility is necessary to make a diagnosis. In the presence of fever, rigors, tachycardia, jaundice or persistent anaemia, following an abortion, confinement or salpingo-oophoritis, an X-ray film of the chest should be taken, and may have to be repeated several times in the course of the illness. In 3 of our cases the condition was not suspected until after the development of signs and symptoms pertaining to the respiratory tract. After we became aware of the condition, 2 cases of pulmonary emboli were diagnosed before the development of respiratory symptoms.

Blood cultures are not always helpful in isolating the infective organism. In only 2 of our 5 cases were bacteria isolated, even after repeated cultures. The organisms which were cultured either from the blood or the cervix, and which were thought to be responsible for the pyaemia, were \( \text{E. coli} \) (2 cases), \( \text{B. proweus} \) (1 case), \( \text{S. pyogenes} \) (1 case), \( \text{S. pyogenes} \) and \( \text{E. coli} \) (1 case).

On pelvic examination hard tender cords of thrombosed veins may be palpable in the base of the broad ligament. \(^9\) In our cases there were either no abnormal physical signs in the pelvis, or there was so much induration due to a parametritis or salpingo-oophoritis, that any thrombosed veins could not be identified apart from these masses.

Collins et al. \(^7\) suggest that the venous return from the uterus should be interrupted by ligation of the inferior vena cava and ovarian veins through the intraperitoneal route, so that both ovarian veins can be tied and any pelvic abscess drained at the same time. In 4 of our cases the vessel was approached extraperitoneally as this was more easily performed with less trauma to the patient, but in the fifth case the intraperitoneal route was used, the inferior vena cava being inaccessible due to marked periophlebitis.

Often no postoperative sequelae are seen in the lower limbs, except for mild oedema which tends to persist for a few weeks. There appears to be an adequate collateral circulation through the vertebral, azygos and portal veins. \(^10\) The superficial veins of the trunk are the least important. If there is oedema of the lower limb before operation, this will persist or be aggravated (case 3). It appears that lower extremities with pre-ligation evidence of thrombophlebitis have more unfavourable sequelae such as oedema, ulceration, pain and dermatitis, than those without previous disease. \(^11\)

Ligation of the inferior vena cava prevents further dissemination of the majority of septic emboli to the body, above the occlusion. The infection is localized to the pelvis allowing antibiotics and the natural defensive mechanisms of the body to resist and overcome it. There is also a reduced venous return to the heart and a bradycardia after ligation. \(^12\) This may improve the cardiac capacity especially if there is a toxic myocarditis.
SUMMARY

Septic pulmonary emboli and infarction were demonstrated in 5 cases following suppurative pelvic thrombophlebitis. These patients were critically ill and, in spite of medical treatment, their condition continued to deteriorate. Ligation of the inferior vena cava was performed. Four of the 5 cases survived, and evidence is presented that a fatal outcome was averted by the operation. The fifth case died as a result of a ruptured bronchus after lobectomy for a lung abscess.

We wish to thank Messrs. J. Hunt, S. Sher and other members of the medical staff of Baragwanath Hospital for their assistance with these cases. The illustrations were produced by the Photographic Unit, Department of Medicine, University of the Witwatersrand.

AN OUTLINE OF A NATIONAL HEALTH EDUCATION PROGRAMME*

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BASIC PRINCIPLES OF HEALTH EDUCATION

The general aim of health education is to propagate practical knowledge and understanding of health and disease in the community; by doing so, to ensure the cooperation of the community members in the optimum use of the available preventive and curative facilities and to raise the general level of hygiene and health. Or to put it briefly; to make the community 'health conscious'.

Health education in a community is conditioned by, broadly speaking, four factors:

1. General level of education—(illiterate, literate, school standard).
2. Existing beliefs and customs.
3. Environmental conditions (hygiene, housing, climate, etc.).

It is not of much use, for instance, to warn Bantu school-children about the dangers of drinking water from streams and dams, when there is no source of pure water available within miles of the school.1

Prerequisites for effective health education are: (i) the information must be culturally acceptable to the community and adapted to local circumstances—health education should be put across in the cultural concepts and terms of the local inhabitants; (ii) existing beliefs and existing social processes should be added to little by little, without destroying the fundamental beliefs; (iii) it should be provided with the active cooperation of the people and not for them. 'Health cannot be imposed upon a people; it must be won in partnership with them.'2

Differentiation

In a culturally heterogeneous society, health education has to be differentiated according to the various separate communities, as well as to special groups inside a given community. Not only physical, but also cultural factors and social distance are of importance, e.g. rural and urban. It is not true that only ignorant and illiterate people are in need of health education. To highly intellectual groups health education is as important as to the illiterate: ignorant Bantu have to be educated about tuberculosis, but professional persons about preventing ischaemic heart diseases. Prevention of neuroses or lung carcinoma is more important to the White population than to the Bantu, etc.

A health education programme for a community has to be based upon a combination of data gathered by the following sciences: general education, language, anthropology, psychology, sociology, agriculture, hygiene and medicine. If this information is not already available, it has to be collected by the cooperation of many experts in these various fields.

Methods of Health Education

The basic methods are verbal instruction (personal, radio, discussion groups); printed material (posters, leaflets, cartoons, books); visual instruction (slides, films, television?). These can be applied on an individual basis, on a group basis or by use of mass media (newspapers, radio, films, lectures).

Stages in Health Education

Propaganda is a forerunner of real education. Propaganda works through suggestion and covers only certain aspects of a picture; it does not encourage criticism or objective scrutiny of its statements; its appeals are closely related to desire and emotion.

Education, as contrasted with propaganda, challenges inquiry into all variables or aspects of related situations. Its methods should encourage and invite independent thinking; it stimulates objective criticism and assessment of accepted facts.

It is quite obvious that for the less civilized population groups 'health propaganda' can bring a quick return, while on a long-term view, 'health education' is the more desirable.

A major obstacle encountered in health propaganda or education is prejudice. Prejudice is a conglomeration of beliefs, attitudes and values resulting in a biased (positive or negative) judgement of persons or things; it is highly charged emotionally and can be very resistant to changes. Causative factors in the acquisition of prejudice are: home and school; religion; economic factors; social factors; and ethnocentric and cultural factors.

A health programme, as differentiated from health education, is the practical execution of certain health measures, for which the health education has laid the mental and psychological foundations. A health programme should always be preceded by a health education drive.

The objectives of a health programme can be the eradication of infectious diseases (TB, polio, malaria, bilharzia, etc.); immunization (prevention of infectious diseases); reducing child morbidity and mortality; the fight against various diseases (e.g. cardiovascular disease); campaigns against smoking, alcoholism, etc.; prevention of accidents, industrial hazards, etc.; improvement of nutrition, and the improvement of mental health.

REFERENCES


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