ABRUPTIO PLACENTAE, WITH SPECIAL REFERENCE TO COAGULOPATHY: TWO YEARS' EXPERIENCE AT EDENDALE HOSPITAL*

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SUMMARY

ifty-four cases of severe abruptio placentae seen over a ·year period are reviewed. Aetiological factors are ·vestigated and improved methods of management escribed. As far as the resources of a relatively un-·phisticated laboratory would permit, failure of blood ·agulation was investigated and a distinction between ·pofibrinogenaemia with and without hyperfibrinolysis as drawn. Seventy-five percent of cases were found to ıve a deficiency in blood coagulation.

The aetiology and management of coagulopathy are scussed, and it is evident from the literature that there by no means universal agreement on these two aspects. lthough we reached a well-grounded theoretical basis r management, in practice it is not easy to adhere to. ıboratory investigation and control must be prompt to · of use, but our out-dated, slow methods only managed produce results in time to confirm or refute the haema-logical diagnosis in retrospect.

lendale Hospital, a non-White hospital in the centre Natal, caters mainly for a large population of under-ivileged, malnourished Bantu. Among such a group, :glected obstetrics' and a high incidence of abruptio ıcentae is to be expected.

The criteria for selecting this series of abruptio placen-: cases were: (*a*) intra-uterine death of the foetus, (*b*) 'ere oligaemia, (*c*) retroplacental clot, and (*d*) occasional lure of coagulation.

From a total of 13 298 deliveries in 1968 and 1969, 55 es of abruptio placentae fulfilled these criteria—an idence of 4·06 per 1 000 births. This coincides remark-y with the figures given by De Valera,[1] for the same eria: 3·7/1 000 births (actual figures 195/51 401 births); were high in comparison with figures by Brame *et al.*[2] m Virginia: 2·1/1 000 births (actual figures 63/29 256 iveries) and low in comparison with Basu[3]: 5·8/1 000 hs (actual figures 322/55 000 deliveries).

Abruptio placentae is one of the 4 major obstetrical ses of foetal and maternal deaths, the others being mpsia, ruptured uterus, and prolonged obstructed our. Of these 4, abruptio placentae is probably most ortant because improved management of the condi-is possible.

ecent and continuing accumulation of new knowledge ut the various aspects of this condition are of interest. ay, abruptio placentae is seen in quite a different light n 10 years ago, due to the improvement in management lood and fluid replacement, early surgical treatment, ker recognition and treatment of renal failure, and ter understanding of coagulation failure.

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AETIOLOGY AND INCIDENCE

Folate Metabolism and Malnutrition

The question of deficiency of folates, particularly at the time of conception, continues to be debated in the higher obstetric courts but, since we did not investigate this, I have nothing to add. However, a dietary deficiency is considered by some authorities to be an aetiological factor. Certainly our patients were in a low socio-economic group, and were usually malnourished; but they also came from different parts of Natal—no two patients in this series came from the same area.

Trauma

This is a rare but definite cause of abruptio. In our series, 1 multiparous woman had an external cephalic version for a breech presentation. The abruptio followed a few hours later. A second patient had been viciously assaulted: her injuries included a broken arm and severe abdominal bruising.

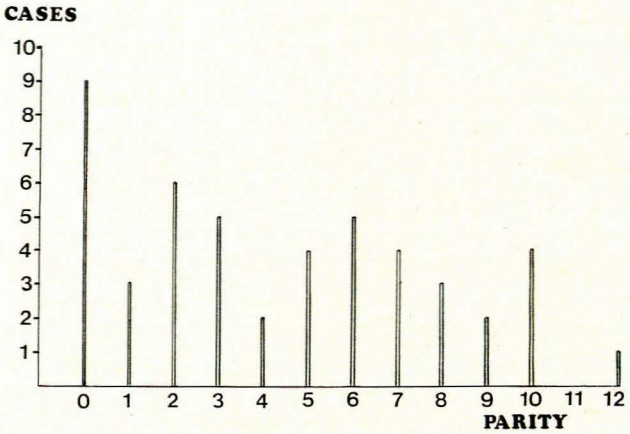


Fig. 1. Parity incidence of abruptio placentae (not corrected for pregnancy incidence).

Parity

Fig. 1 indicates a high incidence of abruptio placentae in the primigravid and in the gravida 5 and over. Considering the much higher numbers of primiparae compared with grand multiparae, the incidence in multiparae is remarkably high. (The incidence of primigravidity in a random selection of women is 40%. This falls rapidly to isolated cases at gravida 10 and over. The hospital group selected may not be representative of the population at risk, but tends to confirm the high incidence of primigravidity in the population and reinforce the view that excessive parity is an aetiological factor in abruptio.)

Donald[4] states that abruptio placentae occurs 4 times as frequently in multiparous patients as it does in primigravidae and our ratio of 9 - 39 corresponds with this.

Hydramnios

There were no cases of true hydramnios in our series, but there were 4 cases of physiological hydramnios in the form of twin pregnancies.

Hypertension

This was present in 32 cases and persisted after delivery for variable periods of time. It was difficult to distinguish the hypertension of pre-eclamptic toxaemia from essential hypertension and, in some cases, even from renal disease. The occurrence of oligaemia causing transient proteinuria is well known and, during the first few hours, vasoconstriction producing arterial hypertension was almost inevitable. No definitive renal disease was diagnosed apart from cases of renal failure due to renal cortical ischaemia.

Foetal Hypertension

In a case report on sclerosis of the umbilical cord, Malpas[5] theorizes that this may result in hypotension in the intravillous space and be instrumental in causing the abruptio from the foetal side. We did not find any similar cases.

Supine Hypotensive Syndrome

The gravid uterus pressing on the vena cava while the patient is in a supine position may partly obstruct this vein and cause back pressure in the uterine veins and venous haemorrhage at the placental site. Since this is most likely to occur at night, a record of the approximate times of onset (as judged by pain and vaginal bleeding) is shown in Fig. 2.

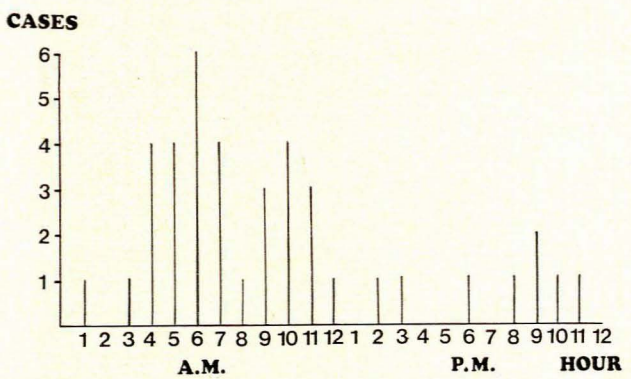


Fig. 2. Diurnal incidence of time of onset.

It is evident from Fig. 2 that the majority of incidences of the supine hypocursive syndrome began in the early hours of the morning—this may be circumstantial evidence in favour of the theory.

Seasonal

The time of year could be a factor inasmuch as with an agrarian population, nutrition is closely linked with the harvest. Times of conception and times of abruptio were plotted in relation to their month but no significant trend was observed.

CLINICAL PRESENTATION

Symptoms

The earliest symptom is characteristically a boring sacral pain, but sometimes it is a localized sharp abdominal pain. This is nearly always followed by vaginal bleeding.

The patient often presents severely shocked, when there is no doubt about the diagnosis.

Signs

Bleeding occurs in virtually all patients, but the severity varies considerably. We recorded amounts from as little as a cupful, to what one woman described as a 'bucketful'

Vasoconstriction is also usually severe. The blood supply to the limbs, the kidneys and the liver is greatly reduced—a causative factor in the occasional ischaemic cortical necrosis.

Oligaemia is present, but is often unrecognized because of conventional changes in blood pressure and pulse. We often found the blood pressure above normal. Whether the patients were hypertensive before the incident or became hypertensive after it, we were unable to say. We found the best way to gauge circulating blood volume was with a central-venous-pressure manometer.

Fig. 3 shows that nearly all our cases were normotensive or hypertensive on admission, whereas in the cases where

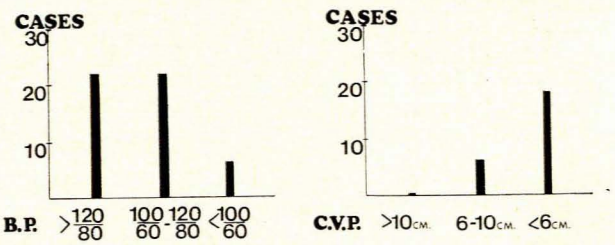


Fig. 3. Blood pressure and central venous pressure at time of admission.

a CVP manometer was used, there were no normal levels recorded and the majority were less than 6 cm water.

Furthermore, with transfusion, the blood pressure may rise even higher or remain steady while the CVP will steadily rise. This is without doubt one of the most useful advances in the management of abruptio.

Extragenital haemorrhage, such as skin petechiae, are widely reported, but are not easily seen in the pigmented skin. Three of our patients did bleed from the nose and gums, and one bled from the rectum. Haematuria was present in catheter specimens from 8 cases.

MANAGEMENT

At Edendale Hospital we developed a system to guide the duty doctors in specific management:

The first move is to start special investigations as resuscitation is instituted. A blood sample is taken for a haemoglobin test, full blood count, platelet count, Schumm's test, and spectrometric examination for haemoglobinaemia. A further blood sample is taken for urea and electrolyte estimation, and heparinized blood for pH, PCO_2 and acid-base status tests. Blood compatibility tests are done, and 6 units of blood ordered. A blood specimen in a plain tube is observed for clotting time and later gross clot lysis. Coagulation tests are also performed.

A catheter specimen of urine is sent for microscopy, biochemistry and spectrometry, and perhaps for a later urinary haemoglobin test.

Resuscitation is by blood and fluid replacement through 2 intravenous catheters, one in an arm and the other in the external jugular vein—this also serves as a central-venous-pressure (CVP) manometer. One to 2 litres of Ringer's lactate solution is usually transfused as fast as possible. This is followed by 3 units of warmed fresh blood within the first hour. Transfusion is completely dependent on the CVP reading (taking the normal as 10 cm water above the left atrium) and the urine output. The CVP is now set up regardless of the degree of shock, because patients sometimes become shocked after admission. We had no patients with pulmonary oedema or triple rhythms.

Sodium bicarbonate solution is used in empirical amounts of 200 mEq to combat the acidosis of prolonged shock.

Further Management

1. A Foley catheter is passed to observe hourly urine output and, if this is less than 30 - 40 ml/hour, a diuretic such as furosemide (Lasix) is used to increase urinary secretion and prevent renal tubular necrosis.
2. As soon as the oligaemia is reasonably reversed, the state of the cervix is assessed and the membranes artificially ruptured.
3. Morphine sulphate gr. 1/8 - 1/6, is administered by slow intravenous injection.
4. Antibiotic treatment is instituted.
5. If present, a coagulation defect is corrected.
6. A watch is kept for falling urinary output.
7. A possible diagnosis of micro-angiopathic haemolytic anaemia is considered.

The use of intravenous oxytoxic drugs is avoided because the uterus is usually already hypertonically contracted and further stimulation may result in rupture. As mentioned later, towards the end of our 2-year study less and less fibrinogen was used in the treatment of hypofibrinogenaemia.

Quarter-hourly observations on a 'flow sheet' keep the staff informed on the success of resuscitation, whether the patient is bleeding, the progress of labour, and the onset of oliguria.

Epsilon aminocaproic acid and Trasylol were used in cases, as indicated later. Heparin was used in 1 case in this series.

Indications for surgical intervention are not strictly defined, but are as follows: (*i*) failure of labour to progress after artificial rupture of the membranes; (*ii*) oliguria not responding to fluids and diuretics; and (*iii*) suspected ruptured uterus.

It is important to mention the necessity of team work. Our experience proved that 3 doctors was the minimum number to manage a patient satisfactorily. One houseman to manage infusions and drug administration, and a second to concentrate on investigations, liaison, observations and recording the activities of all 3. The third team member is the registrar who performs the examinations and carries out procedures such as rupture of membranes, while keeping himself available for consultation with the laboratory and his chief. Possibly his main job is to co-ordinate the group and make sure that a dynamic situation receives dynamic attention.

RESULTS

Blood Transfused

No coagulopathy: av. 2 115 ml blood; simple hypofibrinogenaemia: av. 3 780 ml blood: hypofibrinogenaemia plus lysis: av. 4 365 ml blood.

From this it can be seen that the worse the coagulopathy became, the more blood replacement was required.

Epsilon aminocaproic acid was used in 3 cases; Trasylol in 1 case and fibrinogen in 22 cases—8 g given on average.

Operative Delivery

A total of 13 operative deliveries were made, viz. vacuum extraction (4); craniotomy for failure to progress in labour (2); forceps delivery (1); caesarean section (5 failure to progress and 1 oliguria/anuria); and hysterectomy (1, torn at Caesarean section).

Complications

The following 10 cases with complications were recorded: maternal deaths (2 as a result of renal failure with acute oligaemic shock and renal cortical necrosis); renal failure (2 died and 2 recovered within 10 days); and micro-angiopathic haemolytic anaemia (4).

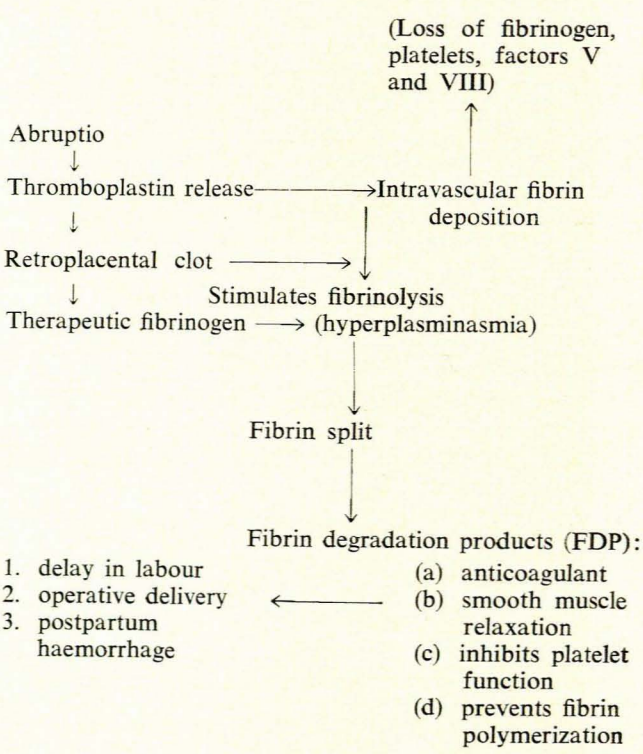
COAGULOPATHY

Incidence

This occurred in 42 cases, distributed as follows: simple hypofibrinogenaemia (32); hypofibrinogenaemia plus lysis (10); and no laboratory evidence of coagulopathy (13).

Pathology

The scheme below shows how coagulopathy arose.[3]



Aetiology

Uterine and placental damage, releasing excessive thromboplastin with fibrin formation, overstimulates the fibrinolytic system and causes the formation of fibrin degradation products.

The time lapse between abruptio and delivery increases the chances, and severity, of coagulopathy (Douglas *et al.*[6]). In our cases the interval varied between 3 hours and 20 hours, the average being 8 - 10 hours. No doubt, this contributed to the high incidence of coagulation failure.

Defibrination was found by Scott *et al.*[7] to be more common in 0 group mothers; expressed as a ratio of 0 group : A group, their figures read 1·7 normal, 3·6 defibrination. Our ratios were 1·01 normal, 1·73 defibrination.

None of these figures was submitted to statistical correction, but in our series the increase in 0 group cases was not obviously significant.

HYPOFIBRINOGENAEMIA

Diagnosis

Stirland's method (heating at 56°C for 15 min) is no longer considered accurate since it gives falsely high levels. The normal range is 200 mg - 600 mg/100 ml.

Thrombin time in dilutions, compared with a control, and expressed in terms of the highest dilution still containing a fibrin clot: normal range 1/64 - 1/128.

Laboratory facilities for these investigations were available on a 24-hour basis. The investigations were repeated at intervals so that we could observe whether the level was rising or falling. On admission, all abruptios were investigated, if only to provide a baseline value.

Treatment

This depended on (*a*) whether the patient was actively bleeding, and (*b*) the personal opinion of the registrar in charge.

Actively bleeding cases were usually given therapeutic fibrinogen, otherwise patients were given fibrinogen only if the registrar in charge decided it was necessary to restore the fibrinogen level to normal.

Although it is assumed that 4 g fibrinogen will raise the blood level by 150 mg (1 000 ml blood contains 1·2 - 1·5 g fibrinogen), the blood and fibrinogen given in certain non-actively bleeding cases failed to raise the blood level by the anticipated amount—although demonstrable lysis was not occurring. Further, the level of fibrin degradation products rises sharply after the administration of fibrinogen (Bonnar *et al.*[8]).

It therefore seems possible that in many cases of severe hypofibrinogenaemia without demonstrable lysis, intravascular defibrination occurs with varying degrees of fibrinolysis. So it might be useful to regard the low fibrinogen in every case of hypofibrinogenaemia as only a sign of an underlying lytic process, not a treatable entity.

FIBRINOLYSIS

Fibrinolysis should more properly be termed hyperfibrinolysis as there is a continuing physiological fibrinolysis which maintains the patency of the vascular tree.

Aetiology

Fibrin formation stimulates the production of plasmin (proteolytic protein). When this process is overstimulated, plasmin is produced in excess and the normal inhibitory effect of the antiplasmins is overwhelmed.

Diagnosis

This used to be done by the crude method of observing the clotted blood lyse in the ward and watching a mixture of control clot and patient's blood lyse. But our diagnoses of lysis were based on the following: (*a*) hypofibrinogenaemia, (*b*) low platelet count, (*c*) thrombin time of a mixture of patient's and control plasma in half dilution, and (*d*) observation of the thrombin clot in all dilutions over 24 hours (lysis here should not be confused with clot reaction).

The last 2 tests are unfortunately susceptible to mistakes in observation, and are not sensitive or specific enough. We would have preferred to do the euglobulin lysis time, a more accurate way of demonstrating plasmin activity; and also the measurement of fibrin degradation products by antifibrinogen immuno-assay using tanned red cells.[9] This would give an indication of peripheral blood-plasmin activity and the extent of the FDP production as a result.

CONCLUSION

Assuming that (*a*) haemostasis in the uterus is by uterine contraction and not by successful coagulation, (*b*) the only cure for the various complications of abruptio placentae is by emptying the uterus, and (*c*) fibrin degradation products have important properties of uterine relaxation, then can we not regard hypofibrinogenaemia as a part of the haematological process of hyperfibrinolysis which produces the noxious degradation products? We could then attribute many of the coagulation difficulties associated with abruptio placentae as being due to the fibrin degradation products' toxic state.

Taking the hypothesis further; treatment should avoid therapeutic fibrinogen and antifibrinolytics, and make use of plentiful transfusion of fresh whole blood or packed cells with early emptying of the uterus.

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