

examined microscopically (wet film, Gram-stained film, and dark-ground illumination), and inoculated on fresh blood agar and chocolate agar for aerobic and anaerobic culture.

**Bladder Specimens of Urine and Biopsy Material.**—Cystoscopy was carried out in Cases 1 and 2. In each case, two samples of urine were taken from the bladder (the early flow and the late flow through the cystoscope). Two biopsy specimens were taken from the base of the bladder, near the ureteric orifices, and immediately placed in physiological saline.

**Inoculation of Material in Fletcher's Medium.**—Specimens, prepared as follows, were inoculated in Fletcher's medium, which is in routine use for culture of leptospira.

**Case 1.**—In view of the high cellular content of the urine, each of the two specimens of urine obtained at cystoscopy was centrifuged at low speed, and after the sedimentation of the cellular elements the supernatant urine was centrifuged at high speed (about 3,500 r.p.m.) for one and a half hours. The supernatant fluid was siphoned off, and the deposit examined by Gram-stained films and dark-ground illumination and inoculated. The biopsy specimens were triturated with a glass rod and inoculated.

**Case 2.**—Both specimens of urine obtained at cystoscopy were examined microscopically and inoculated after slow centrifugalization only, and the biopsy material was treated as in Case 1.

**Case 3.**—Two specimens of mid-stream urine (the early and late flow) were inoculated without preliminary centrifugalization.

**Inoculation of Guinea-pigs.**—In each case equal parts of the two specimens of urine were mixed and injected into two guinea-pigs, one intraperitoneally and one subcutaneously. In the first two cases centrifuged deposits were injected, and in the third whole urine.

### Results

**Mid-stream Specimens of Urine.**—In each case there was a large quantity of pus with a variable number of red blood cells, the deposit constituting up to about a tenth of the volume of urine. No organisms were seen in the stained films, and all cultures remained sterile. Actively motile spirochaetes were seen on dark-ground illumination in all three cases, but not in the actual specimen used for inoculation in Case 3.

**Inoculations in Fletcher's Medium.**—Dark-ground examination of the cultures after incubation at 30° C. for three days revealed scanty spirochaetes in those of the late-flow urine and biopsy material in Case 1. The culture of the early-flow urine in this case, and of all the specimens in the other two cases, remained sterile.

Subcultures were made of the growth obtained in Case 1. Preliminary studies showed that the spirochaete morphologically resembled leptospira, and electron microscope photography revealed that it was identical morphologically with *L. canicola* and *L. icterohaemorrhagiae* grown under identical conditions. Attempts are being made to identify it further.

**Inoculated Guinea-pigs.**—**Case 1:** both guinea-pigs were killed after eight weeks, and no evidence of disease was found. **Case 2:** both guinea-pigs died of intercurrent infection (bronchopneumonia) after six weeks. **Case 3:** both guinea-pigs were killed after 17 weeks; no evidence of disease was found.

### Discussion

There are several possible explanations of the fact that, although actively motile spirochaetes were seen in

the urine of all three cases, they were from only one case. Spirochaetes are notoriously difficult to grow, especially in primary culture, and the necessary element of luck may have been present in the first case. Spirochaetes were seen on dark-ground illumination in only two of the three specimens used for inoculation. Different batches of media were used for each case. Apart from the biopsy specimens, the preparation of the material for inoculation was different in each case.

Obviously the evidence presented is not adequate to prove that the spirochaete isolated is the causative organism of the syndrome described, and further investigations are required. It is, however, a very unusual finding, which may contribute to the elucidation of the cause of abacterial cystitis and extend the knowledge of the leptospira.

### Summary

A brief description of the main features of the syndrome of abacterial cystitis is given, and three case histories are quoted. Actively motile spirochaetes were seen in the urine of each of these three cases. A spirochaete morphologically closely resembling leptospira was grown from the urine of one of them, but not from the other two.

We are indebted to Professor J. W. McLeod, F.R.S., for advice and encouragement, and to Mr. H. D. Moore, F.R.C.S., for carrying out the cystoscopic examinations.

### REFERENCES

- Coutts, W. E., and Vargas-Zalazar, R. (1946). *British Medical Journal*, 2, 982.  
Fieldsend, A. B. (1947). *Ibid.*, 1, 422.

## THE VALUE OF EXTERNAL CEPHALIC VERSION UNDER ANAESTHESIA

BY

**DEREK FREETH, M.D., M.R.C.O.G.**

*Chief Assistant, Central Middlesex Hospital*

AND

**J. S. MacVINE, M.B., F.R.C.S.Ed., M.R.C.O.G.**

*Obstetrician, Central Middlesex Hospital*

External cephalic version without anaesthesia is an established procedure forming an important part of antenatal care in preventing the foetal loss and dystocia associated with a breech delivery. The same cannot be said for version under anaesthesia, and the published results of this procedure are few. White and Flew (1933), in reporting 92 cases, stressed the dangers of vaginal bleeding which occurred in six of their patients. Wrigley (1934) reported 76 cases with successful version in 45 and assessed the foetal mortality at 13%. This figure seems surprisingly high by modern standards, but it compared favourably with the foetal death rate of 28% for breech delivery given in the same paper. Newell (1941) recorded 48 cases with 18 successes. Peel and Clayton (1948) reported a success rate of 87% in 172 primiparae with four foetal deaths due to version under anaesthesia and a success rate of 89% in 64 multigravidae with no foetal mortality attributable to the version. Their total foetal mortality due to version under anaesthesia was 1.7% in a total of 236 cases (253 attempts), but five infants were subsequently lost during delivery as a breech or a vertex.

The usually quoted foetal mortality of breech delivery is about 10% (Peel and Clayton, 1948; Munro Kerr and Chassar Moir, 1949; Drew-Smythe, 1950), although Dieckmann (1946) gives a corrected mortality of 4.2%, Seeley (1949) a figure of 3.5% for full-term infants, and Cox (1950) a corrected mortality of 4.98%. In an endeavour to prevent this unnecessary infant loss which may be attributed solely to a breech delivery, and to transform the abnormal to the normal, it has been the practice at the Central Middlesex Hospital to perform version under anaesthesia when attempted version without anaesthesia has been unsuccessful.

The object of this paper is to show the results of a series of cases of version under anaesthesia and to evaluate whether these results justify its use as a routine antenatal procedure. The questions to be answered are: Is there an unnecessary risk to the mother and foetus by using anaesthesia when previous attempts without it have failed, and is its use justified by the number of successes obtained? If it can be shown that the risks are slight, and that the foetal mortality is materially lower than that of breech delivery, a strong case will have been established for its more widespread adoption.

The essential advantage of anaesthesia is that it overcomes the common factors preventing version in the antenatal clinic—namely, resistance of the abdominal muscles and, to a lesser extent, the contractions of the uterus. We do not agree with repeated attempts at version under anaesthesia, and, if a successful version cannot be performed with anaesthesia once, the patient is allowed to have a breech delivery, or a caesarean section is performed at term if indicated.

The following are regarded as contraindications to version: multiple pregnancy, suspected placenta praevia, toxæmia, previous classical caesarean section, and where an elective caesarean section is to be performed at term. Deep engagement of extended breeches when the buttocks reach the ischial spines are unsuitable cases, as also are those in which a foetal abnormality such as hydrocephalus has already been diagnosed. Munro Kerr and Chassar Moir (1949) think that marked hypertension contraindicates version, and we agree with that view. We do not regard elderly primigravidae as unsuitable cases.

### Technique

The patient is admitted to hospital and detained for the night following the version. Premedication consists of "omnupon," 1/3 gr. (22 mg.), with scopolamine, 1/150 gr. (0.43 mg.). Various anaesthetic agents have been used—thiopentone, thiopentone with ether, "trilene," or cyclopropane, and recently thiopentone with 1 or 2 ml. of gallamine triethiodide ("flaxedil"). Unless the version is completed within one minute of the full dose of thiopentone being given, experience has shown that further attempts are useless until the anaesthetic is deepened, the essential feature of the anaesthesia being adequate muscular relaxation. The Trendelenburg position is not used. The first step is to displace the breech from the pelvic brim to the iliac fossa on the side the back is lying, and in some cases this can be done only by disengaging the breech per vaginam. The head is then flexed and by firm tangential pressure the infant is brought into the transverse. Time is then given for the uterus to relax, still maintaining a steady pressure, and soon the head slips downwards, thus completing the operation. In some cases turning the baby in the

opposite direction will succeed when flexing of the foetal head and trunk have failed. Jerky or forceful movements are never used.

We find that the common left or right sacro-anterior positions are often transformed into posterior positions of the vertex, and consequently the deflexed head remains high immediately after the version. When the patient is seen at the antenatal clinic one week later the head has usually gone down and an anterior or lateral position has been assumed by the foetus. Immediately after the version the foetal heart is counted, and in some cases it has slowed but after a minute or so resumes its normal rhythm. We have not found it necessary to turn the foetus back to a breech because of irregularity or alarming bradycardia of the foetal heart. Pads and binders are then applied and the foetal position and heart are checked again before the patient is allowed home next morning.

### Clinical Results

The following figures represent an analysis of the total number of cases of version under anaesthesia performed at the Central Middlesex Hospital from 1944 to 1950. It must be emphasized that all the cases have had at least one, and often more than one, attempt at external version without anaesthesia, and thus the present series represents only the most difficult cases. The total figures for both primiparae and multigravidae are set out in Table I. The 11 stillbirths and neonatal deaths include

TABLE I.—Results of Whole Series

Total No. of Cases	Maternal Mortality	Version Successful	Stillbirths and Neonatal Deaths	Foetal Mortality Due to Version
214	Nil	174 (81.3%)	11	3 (1.4%)

five from foetal abnormalities and one from pre-eclamptic toxæmia which developed after the version.

Table II represents the detailed analysis of the primigravid patients, and for the purposes of this investigation patients who have had one previous miscarriage have been included with the primigravidae.

TABLE II.—Analysis of Primigravid Patients

Total No.	Successes	Stillbirths and Neonatal Deaths	Foetal Loss Due to Version	Delivery			
				Normal	Forceps	Breech	Caesarean Section
135	105 (77.7%)	6	Nil	84	18	23	10

Of the six foetal deaths in the primigravid patients three were neonatal deaths due to spina bifida with hydrocephalus. The fourth case developed severe pre-eclamptic toxæmia of pregnancy for which a surgical induction was performed. This patient had an inert first stage of labour lasting 48 hours, but the foetal heart was quite strong and regular till the late first stage, when it suddenly ceased. An 8 lb. 7 oz. (3.8 kg.) stillborn infant was subsequently delivered by forceps. We consider that the well-developed pre-eclamptic toxæmia associated with a long first stage of labour was responsible for this foetal death. The fifth case had a successful version at 38 weeks on March 12, 1948, and was seen regularly at the antenatal clinic until April 7, the foetal heart being heard on every occasion. The patient

was admitted in labour on April 12 with the membranes intact, but she had not felt any foetal movements during the previous 48 hours. She had a normal delivery in 13 hours 30 minutes, and a stillborn infant weighing 7 lb. 14 oz. (3.6 kg.), length 22½ in. (57 cm.), was delivered. The placenta was extensively infarcted, and as the patient was 23 days overdue it was considered that this intrauterine foetal death was attributable to placental insufficiency and post-maturity. The sixth case had a normal delivery, but the midwife in charge had considerable difficulty in delivering the shoulders of a 9 lb. (4.1 kg.) infant which could not be resuscitated. This foetal death must be attributed to the delay in delivering the shoulders.

Table III represents the detailed analysis of the multi-gravid patients. Two of the foetal deaths were due to perforations for hydrocephalus. The other three cases are reported more fully.

TABLE III.—Analysis of Multigravid Patients

Total No.	Successes	Still-births and Neonatal Deaths	Foetal Loss Due to Version	Delivery			
				Normal	Forceps	Breech	Caesarean Section
79	69 (87.3%)	5	3 (3.7%)	67	2	8	2

*Case A.*—Attempted version was made at 36 weeks on April 21, 1949, and the foetal heart was heard the next day. The patient was admitted in labour on April 24 with the membranes intact, but the foetal heart could not be heard; vaginal bleeding had not occurred between the attempted version and admission to hospital. The patient had an assisted breech delivery of a 5 lb. 15 oz. (2.7 kg.) stillborn infant. The reason for this intrauterine foetal death is not clear, but it must be attributed to the attempted version.

*Case B.*—This patient had a particularly bad obstetric history consisting of an abortion in 1935; a breech delivery in 1936 of a 6½ lb. (2.95 kg.) infant who died from jaundice on the third day; further abortions at three months in 1937 and 1938; and five-month abortions in 1939 and 1940. In 1942 she had a normal breech delivery of a 6 lb. 6 oz. (2.9 kg.) baby which is alive and well. In 1943 she became pregnant again but developed massive oedema of both legs without hypertension, and an intrauterine foetal death occurred at 35 weeks. She was Rh-positive, her W.R. was negative. In her ninth pregnancy external version under anaesthesia on January 18, 1946, at 35 weeks proved unsuccessful. The next day she had a slight "show" which did not recur or affect the foetal heart. She was next seen at the antenatal clinic on January 23, when the foetal heart was again recorded, but in the meantime she had developed oedema of the legs. She went into labour on January 31, having felt no foetal movements for the previous 48 hours, and a stillborn infant was delivered. She thus repeated the events of her previous pregnancy—namely, the rapid onset of oedema at 35 weeks followed by an intrauterine foetal death. This patient was clearly predisposed to unstable pregnancies and had already had two previous breech deliveries. On mature consideration we conclude that the attempted version under anaesthesia was not justified. In spite of the oedema this case has been included as a foetal death due to version in view of the vaginal haemorrhage.

*Case C.*—This case of a woman aged 40, who had a ruptured uterus due to version under anaesthesia, illustrates one of the possible dangers of this procedure. Version under anaesthesia was undertaken on April 21, 1949, when she was 36 weeks pregnant; vaginal bleeding did not occur during the operation. In the night, however, she complained of abdominal pain, and the uterus was very tense, tender, and irregular in contour. There was a little dark

red loss per vaginam. Radiographs showed the foetus partly through the uterus on the left side of the posterior fundal wall. Laparotomy was performed and the foetus was found protruding through a vertical rent on the posterior surface of the uterus; 10 oz. (284 ml.) of dark blood was present in the peritoneal cavity. The foetus, which weighed 5 lb. 2½ oz. (2.3 kg.), was delivered from the uterus followed by the placenta and membranes, the rupture was repaired, and the patient made an uneventful recovery. At operation no abnormality was seen to account for the rupture.

Table IV shows the number of attempted versions at the various stages of pregnancy, with their corresponding successes.

TABLE IV

Weeks	No. Performed	No. Successful	Weeks	No. Performed	No. Successful
34	25	23	37	54	44
35	26	21	38	24	12
36	79	69	39, 40	6	5

The caesarean section rate for the series was 5.6%, only 12 sections being done from a potential number of 214 breeches. Bicornate and subseptate uteri accounted for three of the primigravid sections; two were unsuccessful versions with contracted pelvis; two were for breeches with inertia; one was performed for an unsuccessful version followed by pre-eclampsia; one was performed on a successful version, as a soft tumour in the pelvis prevented engagement of the head; and one was a successful version followed by an unsuccessful trial of labour for disproportion. One of the two multi-gravid sections was performed for lateral placenta praevia and the other because of a ruptured uterus (Case C.).

### Complications

Apart from Cases A and B, reported above, premature labour due to the version occurred in only seven of our cases, with no foetal loss. The cord came down with the breech in three unsuccessful cases and prolapsed in one vertex presentation, all without foetal loss; there were no compound presentations. Prolapse of the cord is always possible after version, whether the infant has been turned or not, and we endorse the advice of Munro Kerr and Chassar Moir to perform a vaginal examination early in labour to determine if the cord is presenting.

Two cases returned to a breech presentation after a successful version and have therefore been included among the unsuccessful cases. One case, with a contracted pelvis, returned to a breech, but was turned again under a second anaesthetic and subsequently had a trial of labour with a normal delivery of a 6 lb. 2½ oz. (2.8 kg.) baby.

A small number of vaginal haemorrhages occurred during the version, the loss never being severe. We do not consider such loss of serious import, providing it is seen and the operation immediately stopped.

Extended legs occurred in 79.2% of cases x-rayed before using anaesthesia, while of the cases subsequently having a breech delivery the legs were extended in 87.5%. We therefore believe that if the legs are flexed external version should succeed.

### Discussion

In assessing the foetal mortality the infant loss due to the version as well as those subsequently lost in labour

as a breech or a vertex must be taken into account when comparing these results with a series of breech deliveries. Of previous publications on the foetal risk in breech delivery one of the most important is by Lloyd Woodrow Cox (1950), of Liverpool, whose figures must be regarded as a challenge to the low foetal risk of version under anaesthesia. Cox gives a foetal mortality rate for uncomplicated breech delivery in Liverpool for the past 16 years as 4.98%, and 3.2% for the past five years. We lost six infants from a total of 214, three due to version, one from toxæmia, one from post-maturity, and one from shoulder dystocia. If we regard the death from toxæmia as "complicated" this gives the final foetal mortality as 2.3%, which compares favourably with the Liverpool figures. Cox has also shown that for infants over 7½ lb. (3.4 kg.) the foetal mortality for a breech delivery is 10%; in our series 30.3% of the infants born weighed over 7½ lb. (3.4 kg.).

It is clear that in achieving the excellent figures for breech delivery in Liverpool the caesarean section rate is exceptionally high. Version under anaesthesia definitely lowers the caesarean section rate, as a trial of labour may be safely conducted in suspected disproportion, and this usually results in a normal or forceps delivery. Moreover, the majority of breeches can be turned easily in the antenatal clinic without anaesthesia and we can see no reason why the same success cannot be achieved as when anaesthesia is used; indeed, in all probability it will be greater. We do not agree, therefore, with the Liverpool school, who make "no particular effort to avoid this (breech) presentation" (Cox, 1950), but hold to the view that prevention is better than cure, and it is submitted that the results of this series justify that view.

It might be concluded from these figures that version under anaesthesia should be largely confined to primigravidae, and we incline to this view. We believe that it should be possible to attain an 80% success rate, with a foetal mortality of *nil* or thereabouts attributable to the version, and that the results so obtained cannot be equalled for breech deliveries in primigravid patients in whom version using anaesthesia has not been attempted. Furthermore, it is safe for a version to be performed and for the mother to have her baby at home under the care of her family doctor, thus dispensing with admission to hospital necessitated by a primigravid breech delivery.

Those hospitals that have a high incidence of primigravid breech deliveries and in which version under anaesthesia is not practised should consider whether by adopting this procedure they can reduce unnecessary stillbirth and neonatal deaths.

### Summary

An analysis is given of 214 cases of external cephalic version under anaesthesia. The foetal mortality rate due to the version was 1.4%. Two cases were subsequently lost in labour, giving a final corrected foetal mortality rate of 2.3%. Previous attempts at version without anaesthesia had been unsuccessful in all cases. Version with anaesthesia succeeded in 81.3%.

It is concluded that the number of successes obtained and the low foetal risk justify using this procedure as a routine antenatal measure, thus reducing the stillbirth and neonatal wastage from breech deliveries.

We should like to express our thanks to Miss M. A. M. Bigby for permission to include her cases.

### REFERENCES

- Cox, L. W. (1950). *J. Obstet. Gynaec. Brit. Emp.*, **57**, 197.  
 Dieckmann, W. J. (1946). *Amer. J. Obstet. Gynec.*, **52**, 349.  
 Drew-Smythe, H. J. (1950). In *Modern Trends in Obstetrics and Gynaecology*, edited by K. Bowes, p. 429. Butterworth, London.  
 Kerr, J. M. Munro, and Moir, J. Chassar (1949). *Operative Obstetrics*, p. 166. Baillière, Tindall and Cox, London.  
 Newell, J. L. (1941). *Amer. J. Obstet. Gynec.*, **42**, 256.  
 Peel, J. H., and Clayton, S. G. (1948). *J. Obstet. Gynaec. Brit. Emp.*, **55**, 614.  
 See'ey, W. F. (1949). *Amer. J. Obstet. Gynec.*, **57**, 113.  
 White, N., and Flew, J. D. (1933). *British Medical Journal*, **2**, 346.  
 Wrigley, A. J. (1934). *Ibid.*, **1**, 891.

## MASS B.C.G. VACCINATION IN 'A BRITISH COLONY

BY

A. W. W. ROBINSON, M.D., D.P.H.

Surgeon Commander, R.N.

In Singapore resistance to disease was greatly reduced during the years of enemy occupation, 1942-5. This was particularly true of pulmonary tuberculosis. The local population were deprived of rice, their staple food, and local agriculture was quite incapable of producing an adequate substitute. In addition to starvation, heavy labour conditions, crowded living accommodation, mental depression, and fear all helped to increase the incidence of disease.

In August, 1948, the Health Department in H.M. Naval Base inaugurated a medical service in the Dockyard Asian School, which has a roll of between 500 and 600 children. The naval medical officer of health felt that regular medical examinations of these Asian children would be of use in the early detection of malnutrition, skeletal maldevelopments, and clinical conditions such as tuberculosis, and also that these children should be educated in the elements of health and hygiene.

When the school medical service had been established on a regular basis it was decided to submit the children to a tuberculin test, using the diagnostic jelly of Messrs. Allen and Hanburys. This contains 95% of old tuberculin. The technique employed was to clean with ether an area of skin on the lateral side of the arm. The test and the control jellies were applied to this area in the shape of a diamond, the lower V of which was the test jelly, and the area was covered with a piece of adhesive plaster. There was no preliminary rubbing of the skin with flourpaper. Tests were read at three days and daily until seven days after testing. A positive result was recorded only when there was a reaction of at least five papules or vesicles, or when a raised weal showed on the skin. There were no reactions from the control jelly. Of 574 children tested in this way 52 were not read. Of the remainder, 47 (9%) were positive-reactors and 475 (91%) were negative. The positive-reactors were then submitted to a chest x-ray examination. None showed evidence of active disease, but all had healed lesions.

Discussion of our results with the Singapore Anti-Tuberculosis Association led to their offer of co-operation if we wished to avail ourselves of B.C.G. vaccination. It was arranged that they would provide the vaccine free of charge and would instruct us in the technique