protected by appropriate decompression, using intra-cardiac suction.

Certain criteria must be laid down with regard to the extracorporeal circuit. The pump should be capable of fine variation in flow from zero to 1 litre/minute and is preferably of the DeBakey type. That used at the Children's Hospital, Birmingham, has been constructed in the workshop of the Surgical Research Unit at the Queen Elizabeth Hospital.

Whatever oxygenator is used it should preferably have a low priming volume, and close estimation of variations of the volume of blood within the extracorporeal system should be possible, so that the baby is not bled into the pump circuit or, alternatively, over-transfused. As no suitable screen or disk oxygenator is commercially available in this country for such small infants, a bubble oxygenator was used in the two cases recorded. In the first this was a modified small Lillehei-De Wall oxygenator. For the second baby a regional perfusion oxygenator was used; such an oxygenator is convenient, is disposable, and is supplied sterilized.

In Case 1 the heat exchanger was a simple helix of P.V.C. tubing immersed in a water-tank the temperature of which was varied by adding ice or warm water as required. Better control of cooling and rewarming was obtained in Case 2 by using the small N.E.P. heat exchanger; the water-jacket was surrounded by water pumped from a reservoir through a Leonard mixing-valve. This latter arrangement gives a much finer control of the perfusion temperature.

A high-flow perfusion is used, the volume depending on the adequacy of venous return to the oxygenator. Thus, if partial bypass is established prior to opening the chest as in Case 1 a lower flow must be used owing to the smallness of the venous catheter inserted via an iliac vein. The right atrial catheter should be the largest that can be introduced through the right auricle, and a perfusion of 100-120 ml./kg./min. should be possible.

In an attempt to avoid loss of platelets and fibrinogen during perfusion, heparin is used in a dose of 5 mg./kg. body weight. Neutralization of the heparin is obtained by using hexadimethrine in a dose of 1½:1 of heparin. The hexadimethrine is not given until rewarming has raised the oesophageal temperature to 37° C. By this means the clotting mechanism is restored quickly to normal and troublesome post-operative bleeding is avoided.

It is important to rewarm the infant to 37° C. oesophageal temperature by means of the extracorporeal circulation and to prevent heat-loss thereafter by placing the infant on a water-heated rewarming blanket. If this is not done disastrous falls of temperature can occur during the period of decannulation and chest closure.

The second problem of open heart procedures in infancy is one of size of the heart. The difficulties can easily be met by the use of small retractors and fine needleholders with atraumatic sutures mounted on small needles.

If certain heart conditions in the neonatal period are regarded as constituting surgical emergencies it is a prerequisite that the extracorporeal circulation should be assembled without undue delay. It is usually not possible to call up blood donors at very short notice so that fresh heparinized or ethylenediaminetetra-acetic

acid (E.D.T.A.) blood can be obtained. Acid-citrate-dextrose (A.C.D.) blood taken within five days of operation is usually available at regional blood-transfusion centres. The quantity required is not large, and the use of fresh blood (with added heparin and calcium chloride) is perfectly satisfactory with the technique described (Foote *et al.*, 1961).

It may not always be possible to obtain a complete correction of the cardiac abnormality within the first few weeks of life. It is important to keep operation time and surgical trauma to the minimum necessary. Thus total correction of the tetralogy of Fallot should probably not be attempted as the heart is small, but surgical treatment must be directed to relief of the mechanical obstruction. However, in conditions such as ventricular septal defects, where the heart is large, it should be possible to obtain adequate visualization for a repair.

I am indebted to Dr. Clifford Parsons for his constant help and encouragement and to Sister Barton and the recovery ward staff for their devoted nursing care of these infants.

KEITH D. ROBERTS, Ch.M., F.R.C.S.,
Consultant Thoracic Surgeon,
United Birmingham Hospitals (Children's Hospital)
and Birmingham Regional Hospital Board.

REFERENCES

- Drew, C. E., and Anderson, I. M. (1959). *Lancet*, 1, 748.
Foote, A. V., Trede, M., and Maloney, J. V. (1961). *J. thorac. Surg.*, 42, 93.

Medical Memoranda

Acute Epididymo-orchitis and Teratoma of Testis

Acute non-specific epididymo-orchitis has a varied aetiology, the commonest predisposing factors being urinary infection, virus diseases, and trauma. The response to antibiotics is often indifferent and the swelling slow to subside. It is the absence of any obvious aetiological factor and the persistent enlargement that gives rise to the suspicion of underlying neoplasm.

Several writers have drawn attention to the masquerading of testicular neoplasm as epididymo-orchitis. Rose (1960) describes a case presenting with symptoms and signs indistinguishable from acute viral epididymo-orchitis. Patton *et al.* (1959), in a review of 510 cases of testicular neoplasm, state that epididymitis was the initial diagnosis in 16.3% of cases. Parker and Holyoke (1960) found that non-specific inflammation of the testis and epididymis was the most frequent diagnostic error in cases subsequently proved to be neoplastic. In a survey of 178 cases by Thompson *et al.* (1961) 19 patients were initially thought to have epididymo-orchitis. Cohen and Tomskey (1961) noted that the most frequent finding in teratocarcinoma and embryonal carcinoma was a history of treatment for epididymitis which did not resolve.

Two cases of teratocarcinoma of the testis have been seen at this hospital over the past six years. They illustrate the above presentation and the clinical difficulty of the inflammatory swelling that is slow to subside.

The more malignant forms of teratoma are often haemorrhagic on section, and it is probably this feature which gives rise to the acute episode. As the prognosis in teratocarcinoma is poor careful follow-up of cases of acute epididymo-orchitis of obscure origin is imperative.

CASE 1

A man aged 23 was first seen in August, 1955. He stated that five months previously there was a sudden onset of pain and swelling in the left testicle. He had been treated for acute epididymo-orchitis elsewhere and had received a course of penicillin. There was no history of disturbance of micturition or urethral discharge.

On examination an irregular enlargement of the left testis was observed and testicular sensation was absent. The right testis was normal. Examination of the urine, including culture for tubercle bacilli, revealed no abnormality. Intravenous pyelogram and x-ray examination of the chest showed nothing abnormal. The W.R. was negative.

As all the investigations were negative orchidectomy was carried out; subsequent examination revealed a haemorrhagic cystic tumour that histologically proved to be a teratoma, much of which consisted of adenocarcinoma (Fig. 1).

A course of radiotherapy was arranged, but a further chest x-ray examination revealed pulmonary metastases. The metastases became generalized and the patient died in August, 1956.

CASE 2

A man aged 20 was admitted to hospital on December 30, 1960, with a history of severe pain and swelling of the right testis of sudden onset two days previously. A right inguinal hernia had been repaired in 1956. There were no urinary symptoms and no history of urethral discharge.

On examination the right testis and epididymis were swollen, tense, and very tender, and the overlying scrotal skin was inflamed. The left testis was normal. The temperature on admission was 100° F. (37.8° C.) and the pyrexia lasted eight days. There were no other abnormal clinical findings. Urinary examination was negative. The W.B.C. was 10,000/c.mm. X-ray examination of the chest showed no abnormality. The intravenous pyelogram showed normal renal function and normal pelvi-caliceal patterns. After a course of "sulphatriad" the acute symptoms subsided and the patient was discharged; he was followed up in the out-patient department.

In May, 1961, the swelling was still considerable and clinically indistinguishable from a neoplasm. The Galli Mainini test was negative. The excretion of urinary

gonadotrophins was elevated at 37 human menopausal gonadotrophin units a day. The 17-ketosteroids were 4 mg. a day and 17-ketogenic steroids 16 mg. a day.

An orchidectomy was carried out. The testis was found to be replaced by necrotic haemorrhagic tumour. The capsule was not penetrated. Microscopically there was a teratoma of the testis with adenocarcinomatous elements (Fig. 2). No neoplasm was seen in the epididymis.

FIG. 2.—Case 2. Photomicrograph showing areas of haemorrhage and necrosis and adenocarcinoma.

A further chest x-ray examination showed the lung fields to be clear, and a course of post-operative radiotherapy was given. In September, 1961, there was no evidence of recurrence, and excretion of the urinary gonadotrophins was 38 H.M.G. units a day.

COMMENT

Both these cases of teratocarcinoma of the testis presented initially with signs and symptoms indistinguishable from those of acute epididymo-orchitis. The frequency of this presentation of the neoplasm and the importance of careful follow-up of cases of acute epididymo-orchitis of obscure origin are emphasized, as haemorrhage into a testicular tumour, of which the patient is previously unaware, results in the possibility of the lesion being classified as inflammatory rather than neoplastic.

I am indebted to Mr. S. V. Unsworth and Mr. E. W. Parry for their help and advice, and permission to publish their cases; to the pathology department of Bootle Hospital; and to the central photographic department of Liverpool University.

J. A. SEDDON, M.B., F.R.C.S.,
Surgical Registrar, Bootle Hospital, Liverpool.

REFERENCES

- Boyd, W. (1955). *Pathology for the Surgeon*, 7th ed. Saunders, Philadelphia.
Cohen, A. E., and Tomskey, C. G. (1961). *J. Urol.*, **85**, 613.
Parker, R. G., and Holyoke, B. (1960). *Amer. J. Roentgenol.*, **83**, 43.
Patton, J. F., Hewitt, C. B., and Mallis, N. (1959). *J. Amer. med. Ass.*, **171**, 2194.
Rose, T. F. (1960). *Med. J. Aust.*, **47** (1), 164.
Thompson, I. M., Wear, J., jun., Almond, C., Schewe, E. J., and Sala, J. (1961). *J. Urol.*, **85**, 173.

FIG. 1.—Case 1. Photomicrograph showing adenocarcinoma and areas of haemorrhage.

Tanganyika, which became politically independent in December last year, has become a full member of the World Health Organization. This brings the number of States that are full members of W.H.O. to 109. There are also two associate members.