probably decreased the frequency of the severe form." In France, until 1981–1982, most pregnancies infected by Toxoplasma gondii were terminated according to French law, which allows terminations at any time during pregnancy (especially for hydrocephaly). This means that the vast majority of severe forms never resulted in the birth of a live infant, not to mention the number of terminations involving noninfected fetuses.

The follow-up of infants in our study is certainly too short, but the 1981 series presented follow-up for only an 11-month period. In more than 50% of the placentas, Toxoplasma gondii was not detected at birth, but they were certainly all infected during pregnancy, because the parasite was demonstrated in the fetus at the time of prenatal diagnosis. This tends to prove that treatment with pyrimethamine-sulfadiazine is effective in reducing the number of parasites.

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REFERENCE


Complications of neonatal extracorporeal membrane oxygenation

To the Editor:

Three recent articles published in THE JOURNAL OF PEDIATRICS highlighted complications associated with neonatal extracorporeal membrane oxygenation (ECMO). The incidences of several of these complications seem to vary widely among ECMO centers. Steinhorn et al.1 documented hemolysis during long-term ECMO therapy associated with the appearance of visible clots in the circuit and with the use of a constrained vortex pump in seven consecutive patients. Fink et al.2 reported dramatic thromboembolic phenomena associated with neonatal ECMO in four of nine autopsy cases. Schneider et al.3 reported conjugated bilirubin levels >34 \( \mu \text{mol/L} \) (2.0 mg/dl) in 14 of 36 neonatal patients either during or after ECMO therapy.

These findings differ from our experience with a total of 66 neonatal ECMO cases in San Diego. We detected either clinical or autopsy evidence of thromboembolic phenomena in 11 cases, including three cases associated with severe disseminated intravascular coagulation diagnosed before ECMO, one case with Candida sepsis, three cases with circuit changes for falling platelet count, visible thrombi, and low heparin requirement, one suspected right atrial thrombus not demonstrable at the end of the run, one episode of aortic thrombus associated with an umbilical arterial catheter, one case of right atrial and aortic thrombi not suspected clinically but demonstrated at autopsy, and one severe aortic thrombus present before ECMO. Of 15 deaths, 13 were followed by autopsy examinations, only five of which showed any evidence of thrombosis or embolization.

Daily plasma free hemoglobin measurements performed for all patients averaged 417 mg/L (range from 4 to 132 mg/L). The high incidence of cholestasis observed by Schneider et al.3 is not unlike that reported by Walsh et al.4 (10 of 29 infants). However, this complication has occurred in only six of our patients, in two of whom elevation of the direct bilirubin preceded ECMO.

Systemic hypertension (systolic blood pressure \( \geq 90 \text{ mm Hg} \)) on three consecutive measurements) has been reported to occur in as many as 38 of 41 patients,5 but we observed this complication in only 13 cases. Most of these were transient, responding to decreases in fluid or pressor administration or in pump flow. Only four patients were receiving antihypertensive drugs at the time of discharge.

Thrombus formation in a segment of tubing bypassing the membrane lung (the "membrane bridge") is a common finding in centers using such a segment. This bridge may be eliminated in a number of ways. Clots may occasionally be seen in other areas of the circuit, but passage to the patient may be prevented by positioning an arterial line filter just before the arterial reinfusion cannula in the circuit.

Perhaps the apparently lower rates of these complications at our center will disappear as more patients are treated. It is likely that other complications occur with higher frequency in our ECMO program than at other centers. The point is that these complications might be remedied by minor procedural changes and may not be necessary concomitants of ECMO itself. Anecdotal reports of complications during ECMO therapy must not be discouraged. Neither should they be taken to represent either the usual or the necessary incidences of such problems.

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