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## Tachycardia and heart failure after ritual circumcision

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**SUMMARY** Four newborn babies developed acute heart failure a few hours after circumcision at 8 days. During this procedure, a sponge soaked in epinephrine was applied to the circumcision site and left there for several hours. Treatment was with digoxin and diuretics and signs of heart failure disappeared within 24-72 hours.

Circumcision is the operation most often performed on males in Israel and the United States.

We describe a complication of this procedure that has not hitherto received publicity.

### Case reports

The four babies described here were admitted to the paediatric intensive care unit a few hours after ritual circumcision, which was performed at 8 days of age. All were born normally at term after normal pregnancies, and there were no postnatal complications.

On admission the clinical signs in each baby were similar, consisting of pallor, central cyanosis, tachycardia, tachypnoea, and grunting respirations (Table).

Their heart rates were over 200 beats per minute and the liver was enlarged in three patients. The electrocardiogram (ECG) of all four patients showed rapid sinus tachycardia with a right ventricular strain pattern. Their chest x ray films were in keeping with an acute heart failure and showed cardiac enlargement with mild pulmonary oedema. Metabolic acidosis was present in three patients. Cardiac muscle enzymes were measured in two patients and were normal. Blood lactic acid concentration was investigated in case 1 and was raised at 145 mg/dl (normal range 5.7-22.0 mg/dl). Three patients had raised serum glucose concentrations (above 6.2 mmol/l) during the first hours of admission. Echocardiography was performed in all patients and yielded normal results. Serum electrolyte concentrations were within normal limits and blood, urine, and cerebrospinal fluid cultures yielded negative results.

Table *Clinical and laboratory findings in the four babies*

Case No	Skin colour	Respiratory rate (breaths/min)	Heart rate (beats/min)	Liver edge below costal margin (cm)	Right ventricular strain	Serum cardiac enzymes (U/l)
1	Pale	80	230	6	+	
2	Mild cyanosis	120	220	2	-	CPK 30 LDH 200
3	Pale cyanosis	70	200	3	+	
4	Normal	88	230	4	+	CPK 20 LDH 250

CPK=Creatine phosphokinase (normal 5-130 U/l); LDH=Lactic dehydrogenase (normal 150-370 U/l).

Cases 1, 2, and 4 were treated with digoxin and cases 1, 3, and 4 with furosemide.

The signs of acute heart failure and the sinus tachycardia disappeared in all patients within 24–72 hours. On follow up, repeated physical examination and ECG recordings yielded normal results.

The circumcisions were performed by the same individual and with his cooperation we investigated his procedure.

Among the contents of his bag, a bottle of epinephrine solution 1:1000 was found and apparently this was often used to stop bleeding in circumcision wounds. A sponge soaked in epinephrine was applied to the site of circumcision and left in place for a few hours. We presumed that a considerable amount of epinephrine had been absorbed through the open wound, leading to epinephrine intoxication.

### Discussion

Ritual circumcision has been practised by the Jewish people for the last four millenia. The method that should be used is not laid down in the Bible. Rabbis, also known as 'mohels', who perform circumcision, have adopted the technique passed on for generations by their forebears.

Epinephrine increases the strength of ventricular contractions and increases heart rate by beta receptor activity. It also produces peripheral vasoconstriction of the arterioles and precapillary sphincters by its receptor activity.<sup>1</sup> Because of this vasoconstrictive property absorbed epinephrine can considerably reduce cutaneous blood flow. It is effective only against bleeding from small arterioles and does not control venous oozing or haemorrhage from large vessels. Its metabolic effects are hyperglycaemia, lactic acidosis, and rises in free fatty acids in blood.<sup>1</sup>

Epinephrine is inactivated mainly in the liver by the enzymes catechol-o-methyl transferase and monoamino oxidase. The enzymatic capacity of the neonatal liver to metabolise large amounts of epinephrine is unknown.<sup>2</sup>

Brunjes *et al* have speculated that the increased

excretion of free catecholamines in the urine of premature infants is due to a deficiency of monoamino oxidase activity.<sup>3</sup> Others have proposed that young infants have a relative deficiency of amine catabolising enzymes.<sup>2</sup>

The effects of an overdose of epinephrine in neonates have been described in a few published reports. Local effects on the gastrointestinal tract as a result of an oral administration of epinephrine include gastrointestinal irritation, vomiting, intestinal ileus, and ischaemic damage to the gut wall.<sup>4</sup> Racemic epinephrine given by inhalation has produced paroxysmal supraventricular tachycardia, which was blocked by propranolol.<sup>5</sup> Denton *et al* reported tachycardia, acrocyanosis, and local ischaemia after the local application of a highly concentrated epinephrine solution to a circumcision induced haemorrhage.<sup>6</sup> These symptoms were abolished soon after phentolamine was applied. Cardiac failure has not been described in these reports.

We suggest that the use of topical epinephrine after circumcision should be prohibited and it is hoped that drawing attention to these cases will prevent similar occurrences.

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